REPORT

ON THE

Pittsburgh Transportation Problem

BY

BION J. ARNOLD

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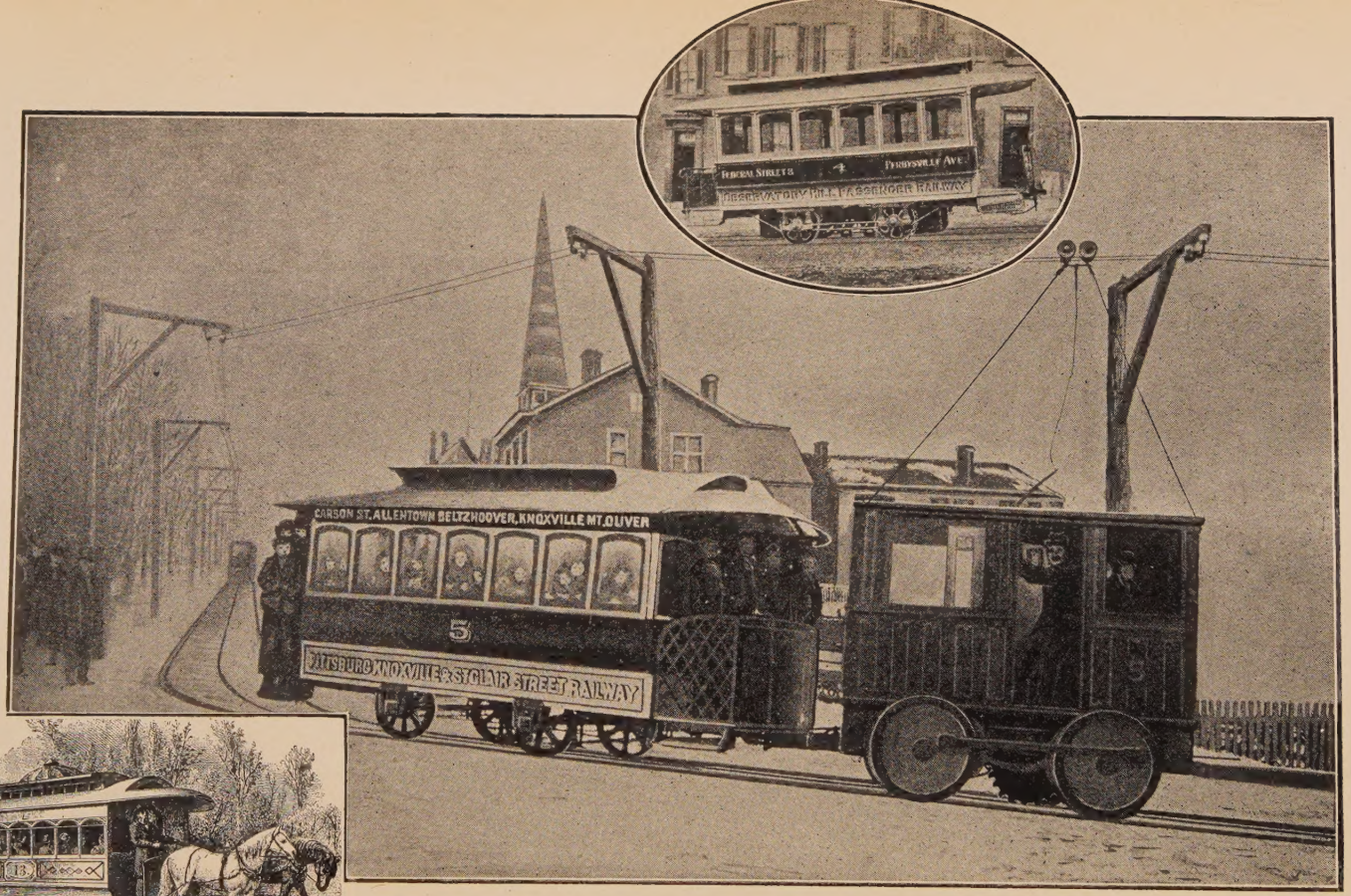
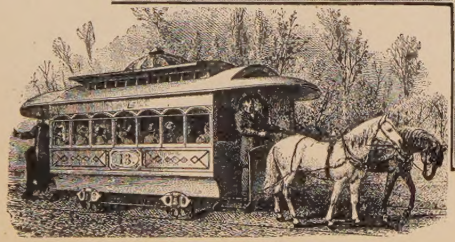

FEDERAL STREET &
PERRYSVILLE AVE.
OBSERVATORY HILL PASSENGER RAILWAY
CARSON ST. ALLENTOWN BELTZHOOVER, KNOXVILLE MT. OLIVER
5
PITTSBURG, KNOXVILLE & ST. CLAIR STREET RAILWAY



1877 Typical Horse Car—Penn Avenue to Lawrenceville.
1888 Daft Overhead electric trolley system—Carson St. to Knoxville.
1889 Bentley-Knight Underground electric trolley car—Federal St., Allegheny.

PITTSBURGH'S EARLY CONTRIBUTIONS TO THE ART OF SURFACE TRANSPORTATION.

By courtesy of Geo. T. Fleming and W. C. Hagan.

REPORT

ON THE

PITTSBURGH

TRANSPORTATION PROBLEM

SUBMITTED TO

HONORABLE WILLIAM A. MAGEE,

Mayor of the City of Pittsburgh.

BY

BION J. ARNOLD,

Consulting Engineer

PITTSBURGH, PENNSYLVANIA

DECEMBER, 1910

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187438

Mayor's Office,
Pittsburgh.

William A. Magee,
Mayor.

January 26th, 1910.

MR. BION J. ARNOLD,
Consulting Engineer,
Chicago, Ill.

Dear Sir:—

I have been authorized by the councils of this city to retain you to investigate and make a comprehensive report upon the transportation problem of the Pittsburgh District.

The subject of transportation is the most important matter now, I dare say, before the people of this city. The city has a street railway system which is a consolidation of many former independent and competing lines laid out according to the designs of the original promoters without regard to any general plan. The consolidated system is now being operated in a manner which brings forth insistent complaints from every section. The steam railroads are now used to some extent by a comparatively limited number of people in their daily travel but this service is only incidental to the main business of the railroads. Questions like those of looping, of through-routing, of transfers, of compensation to the city, etc. must be considered by competent authority. In addition to the problem of correcting the present inefficient service, there is the larger question of making a study for the development of plans for additional transportation not only to meet the present needs of the District but also those of the future.

Knowing that you have made a preliminary study of these matters for the Pittsburgh Civic Commission and outlined a plan for the collection of data which would enable conclusions to be drawn as to the most satisfactory and economical development for both the present and prospective transit needs, and believing that this is one of the most vital and fundamental elements in the proper growth and prosperity of this community, I feel that any report upon this problem, which affects practically every interest, should be made to the city in order to be most effective. The Civic Commission, agreeing with me in this conclusion, has therefore consented to release you from your engagement with it.

I believe that I am speaking the sentiment of nearly every one in saying that these questions should be investigated in a fair and impartial manner and with the sole end in view of learning the truth. You will not be handicapped by any previous conclusions of anyone, going into the field with an unbiased mind and with but little or no knowledge of the present controversy on this subject. And with your experience in the equally difficult fields of Chicago, New York and other places in which you have been one of the leading factors in working out successfully complicated situations as difficult as our own, I have the utmost faith that you will be able to present a plan of action that will appeal to all interests including the transportation company itself. I consider it to be my duty, holding the office I do, to learn all the facts, to know how much better service the people have a right to expect, what improvements in the operation and equipment and extensions into undeveloped territory we may in all fairness demand, what new rapid transit facilities we need and to what extent capital would be justified in making this investment and what technical and financial limitations may exist in the promotion of subways, elevated roads and electrified steam roads, etc. What we want, in a word, is a knowledge of the actual facts in our particular case, so that we may form a comprehensive and logical solution of the whole subject of passenger transportation.

The city is about to enter upon a new era of physical improvement. We intend to widen, extend and alter the grade of streets at congested points in the business district; we are making plans for the elimination of steam railroad grade crossings, regulating vehicle traffic on streets and making other street improvements which are intimately connected with improved transit facilities, and which will be the basis of many other improvements looking to an enlarged and unified Greater Pittsburgh. I shall take this opportunity to bespeak the co-operation of the entire community and its varied interests in working out plans for a more inviting business and residence city and constantly growing and prosperous industrial District.

Yours very truly,

William A. Magee

Mayor.

BION J. ARNOLD
181 LA SALLE STREET
CHICAGO
154 NASSAU STREET
NEW YORK

December 1st, 1910.

HONORABLE WILLIAM A. MAGEE,
Mayor, City of Pittsburgh, Pennsylvania.

SIR:

Complying with the commission entrusted to me by you, as outlined in your letter of January 26th, 1910, I have the honor to present herewith the data which have been collected and such conclusions and recommendations as can be reached at this time in connection with the local passenger transportation problem of the Pittsburgh District.

In this report I have confined myself almost entirely to the surface system because, in my opinion, Pittsburgh's immediate transit needs can and should be supplied mainly by the present street railway system, although a preliminary report on Rapid Transit will be found in connection with the discussion of future developments. This was prepared in order to meet the subway situation which arose during the preparation of this report.

In determining the future needs of the surface system, I have made an analysis covering the record of earnings, the operating expenses and the service supplied by The Pittsburgh Railways Company during the past eight years, or in other words, since its organization as an operating company in charge of the combined railways of the Pittsburgh District.

I have not attempted to show in detail, either the corporate history of the inter-relationships between the various underlying companies forming the system (this information would itself fill volumes), nor the distribution of "fixed charges" in the form of guaranteed rentals and interest on funded debt. Official schedules on either of these subjects have not been available.

Whether or not these fixed charges are excessive—either in whole or in part, can only be determined definitely by making an appraisal of the existing physical property, (with proper allowances for development expenses); but as the making of such an appraisal would entail considerable time and expense, I would not advise it until such time as the results may be used officially.

To determine whether or not the present railway service is adequate, in the absence of such an appraisal, the method to be followed, is to compare the system as at present operated with

its own previous record and then with similar results obtained by electric railways in other metropolitan districts. This has been done and the record presented shows not only the prospects of the Pittsburgh system at the time of organization, but also the decrease in the expected earnings due to business depressions, the expansion of the system into non-paying territory, the increase in cost of operation, and finally the constantly growing deficit due to the cumulative effects of the various causes discussed in detail. The comparative records of the traction systems in nearly all the large American cities are presented both in tabular and also graphical form.

The increasing demands and the opportunities for further traction development in the Pittsburgh District have been shown and the necessity of a comprehensive plan for rehabilitation, betterments, extensions, re-routing and publicity has been, in my opinion, fully demonstrated.

The benefits of having one operating system for the entire District is emphasized in the report and the suggestion offered that the internal affairs of the Company should be arranged in such a way as to remove the present excessive financial burdens and make it possible for the company to furnish the District with continuous adequate service.

In discussing the immediate needs of the situation an effort has been made to show the causes of the present apparent lack of progress in eliminating defects by sketching briefly the history of the system from viewpoint of both the City and of the Company. Both parties to the present arrangement have made serious mistakes in the past and the result is disappointment and dissatisfaction. The improvements that can be made at once are indicated, but the one comprehensive remedy which is pointed out in nearly every chapter of the report is Public Control so as to secure adequate service and at the same time a protected investment. The benefits which will accrue from such a control to the Company, the City and the District are emphasized.

The progress of public opinion in other communities where transportation problems have reached a crisis is referred to, and in the appendix some of the "settlement" ordinances are briefly digested and compared.

The conclusions in regard to rapid transit are more or less tentative, and must necessarily remain in that condition pending developments. The building of subways in Pittsburgh will probably depend upon the attitude of private capital toward financing the enterprise under the restrictions of an indeterminate

franchise with the right of ultimate purchase by the City, and also upon what co-operative arrangement can be worked out between the subway system, the electrified steam roads and the surface trolley system, so as to handle the traffic of the District without destructive competition and therefore without duplication of equipment and investment. The conclusion is reached that eventually the City must have the power to purchase or build subways with its own money.

The electrification of steam lines is referred to only briefly as it seems best to first submit this report upon the street railway system, giving the steam roads sufficient time to furnish the necessary information upon which to base sound conclusions.

I have outlined at the end of the chapter on Pittsburgh's Immediate Transit Needs a suggestion for a definite transit policy, which will, in my opinion, tend toward securing a comprehensive transportation system for the entire District. This policy starts with concessions on the part of both the City and the Company—includes co-operation in working out further problems—and ends with ultimate complete public control of the entire transit situation. The importance of a central control to the progress of the District is demonstrated and the benefits which the present company would derive from a protected investment, are made plain.

This program necessarily involves legal and financial developments which must be worked out simultaneous with the technical problems, and therefore reference has been made to certain legal and financial arrangements which have been found practical elsewhere—particularly in Chicago and Cleveland—in connection with transit situations similar to the one now confronting Pittsburgh, so far as the service and equipment is concerned.

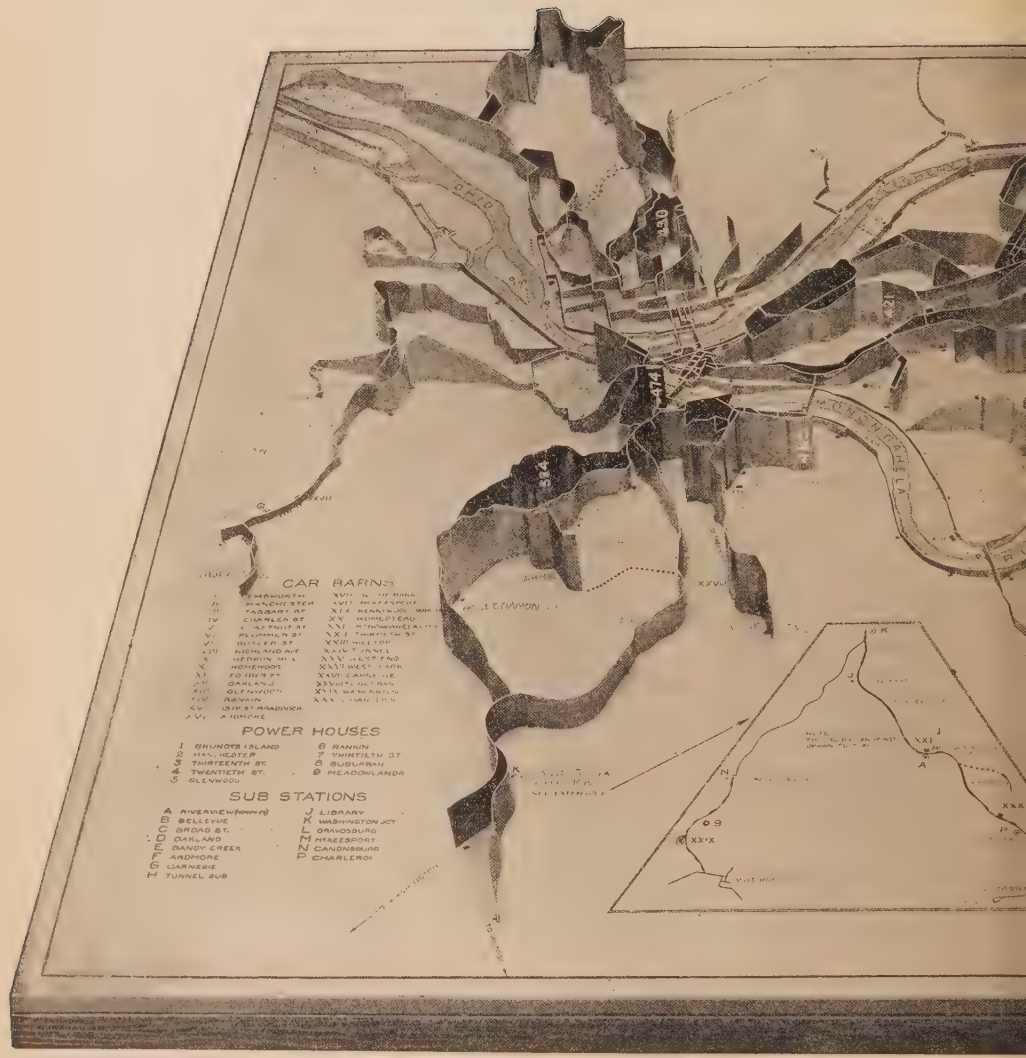
I wish to acknowledge the co-operation of Mr. James D. Callery, President, and other officers of the Pittsburgh Railways Company in placing at my disposal the information shown by the records and by some of the graphical charts, which I have made from the figures supplied to me.

I trust that the information in this report has been put in such form that it will contribute to a more complete understanding of the transportation problem of the Pittsburgh District.

Respectfully submitted,

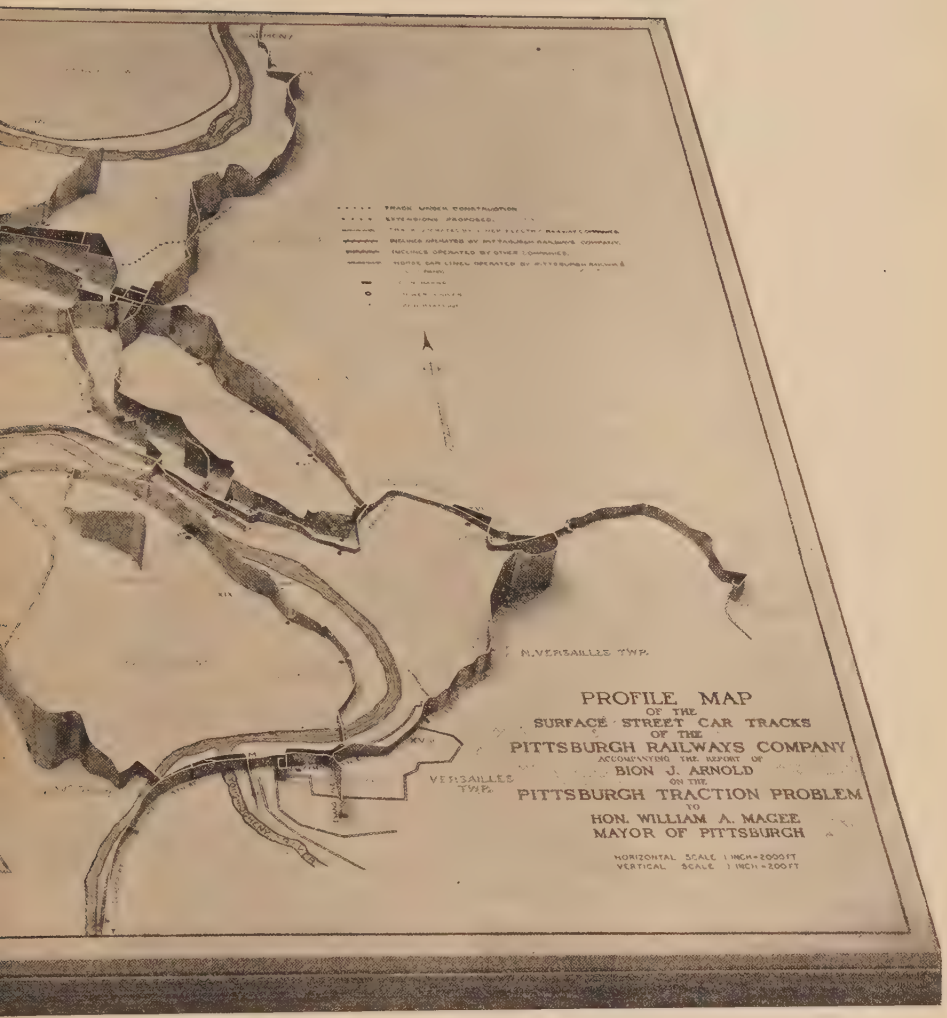
Bion J. Arnold

Consulting Engineer.



RELIEF MAP OF STREET RAILWAY SY

This is a photographic reproduction of a model showing both the location and
Railway Company. The map is laid out on a horizontal scale of 2000 feet to the inch, a
level). From this photograph the elevations can only be judged in perspective. It will,
accomplished with unusual difficulties. As the great majority of passenger traffic cente
ascend heavy grades, with the exception of the Second Avenue line to Homestead, the P
Kees Rocks. Pittsburgh's most direct line to the East End—via Center Avenue—is har
Riverview Park district. The low level tunnel under Mt. Washington has evidently bee
venient interurban connections to the towns South of Pittsburgh.



I IN PITTSBURGH AND VICINITY.

on of the various routes comprising the street railway tracks of the Pittsburgh elevations on a vertical scale of 200 feet to the inch (measured above normal river ver, be apparent at a glance that transportation over the streets of Pittsburgh is he low lying "Point District," nearly every line reaching the suburbs is obliged to venue and Butler Street line to Aspinwall, and the West Carson Street line to Mc- ped by one of the worst hills, likewise the Federal Street-Perrysville Avenue line to ne greatest benefit in reaching the South Hills suburban district and providing con-

SUMMARY OF REPORT.

For the purpose of directing attention to the most important aspects of the Transportation Problem of the Pittsburgh District and in order to enable one to get a comprehensive idea of the problem without being required to read the entire report the following summary has been prepared. The subject has been subdivided in this summary as follows:

1st. Immediate Surface Railway Improvements.

(a) Regulation of Street Traffic.
(b) Control of Steam Road Crossings.
(c) Maintaining of Schedules.
(d) Installation of Automatic Switches.
(e) Operation of More Cars and Larger Cars.
(f) Proper Heating, Ventilation and Lighting of the Cars.
(g) Installation of Improved Rail and Pavement.
(h) Increasing Clearances between Cars and Curb.
(i) Widening Smithfield Street Bridge.
(j) Separating Grades of Trolley and Steam Roads Tracks.

2nd. Future Surface Railway Improvements,
including a *reorganization of the present system* which should provide for:

(a) Rehabilitation.
(b) Improvements and Extensions.
(c) Future Renewals out of Earnings.
(d) Re-routing.
(e) Adequate Service.

3rd. Future "Rapid Transit" Developments
which should provide for:

(a) Subways under the streets of the business district with branches under the rivers and through the hills.
(b) Electrification of the major steam suburban lines, using the subway system as a downtown distributing terminal and as a connecting link between all radiating lines.
(c) A system of transfers between the surface and the rapid transit lines.

4th. Legal Developments,
which should provide by means of Court Decisions or by Legislation for:

(a) Reorganization of the present surface system on a basis of a fair return upon the actual value of the properties.

(b) Control, by Commission, Board, or otherwise, of the financial arrangements, technical details of construction and operation, service supplied and records of results along lines now being demonstrated in the States of Wisconsin, Massachusetts and New York, and in the Cities of Chicago and Cleveland.

(c) City's right to issue self-supporting bonds, independent of the debt limit *for the construction or purchase of Subways*. In order to always insure adequate service by private operation the City should secure the right to purchase the surface system even though this right may never be exercised.

I. IMMEDIATE SURFACE RAILWAY IMPROVEMENTS.

The immediate needs of transportation in the Pittsburgh District have been covered by several reports during the past two years and definite recommendations have been made by the State Railroad Commission. It is not intended that this report shall discuss these findings in detail, as the attention of the City and the Railway officials has already been called to these improvements which should be made immediately without waiting for a complete solution of the larger problems.

Whatever the outcome of the reorganization and regulation of the present surface system, there should be no delay in arranging for proper maintenance of the cars and tracks, for additional larger cars, for improved and maintained schedules and for proper heating, ventilation and lighting of the cars. The City and the Railways Company should give their unremitting efforts towards widening the Smithfield Street bridge and the elimination of dangerous grade crossings, for there are no good reasons why these enterprises should remain inactive pending the development of future policies. The question of more cars, better tracks, improved schedules and the widening of Smithfield Street bridge should be followed up with vigor, and although the necessity may arise for the City and the Company to defend their various rights in the courts, this legal attitude should not interfere with the establishing of a policy of Co-operation and Publicity

upon which future progress must depend for the mutual advantage of all concerned. Actual facts should hurt no one and what is wanted is more of them so that the present atmosphere of suspicion can be removed by an era of actual knowledge.

II. FUTURE SURFACE RAILWAY IMPROVEMENTS.

The future growth and prosperity of the Pittsburgh District depends in a large measure upon the development of the surface trolley system and this report has been confined largely to a discussion of the elements of this part of the traction problem and its solution.

As pointed out in various parts of the report, the future of this surface system depends upon the sufficiency of the plans for rehabilitation, improvements, renewals and adequate service and whether or not such plans are carried out consistently.

Rehabilitation.

Many miles of the tracks of the system are in a bad condition and the paving is so dilapidated in frequent places as to be a serious impediment to vehicle traffic. The condition of Pittsburgh's streets along the car track lines is a serious reflection on the City, and one which neither the City nor the Railways Company can afford to tolerate.

Some of the cars listed by the Company are rapidly becoming worn out and obsolete in style, while some of the power plant equipment still used is so inefficient as compared to more modern types that the continued use of this type of power station cannot be justified. Car houses and repair shop facilities are inadequate on some divisions of the system, and wooden trestles and bridges must soon be replaced by more permanent structures. Overhead construction needs replacing and feeder wire should be put in conduit in the underground district. Millions of dollars could be spent to good advantage at once in the general rehabilitation of the property.

Improvements and Extensions.

The advances made in the art and the constantly growing demands of increasing business indicate that *new capital must be continuously available* for betterments and extensions. Experience in Pittsburgh and in other American cities demonstrates

that when the population is increased by 50%, that the earnings from transportation more than double; that is, the demand for transportation increases much more rapidly than the growth in population. This demand can be cultivated by making it easy to ride, in the same way that the telephone business has been built up, by making it convenient to use telephones. But this conception means a *constant series of improvements.* In the Pittsburgh District, an expenditure of at least $2,500,000 new money for betterments would be justified each year, and if this *new money* is not provided the City and the District will be handicapped in their growth and prosperity as compared with other cities more fortunate in their traction arrangements.

Decided improvement should be made in the form of track construction. A substantial sub-base should be provided, and this should be drained when conditions indicate danger from subsurface water. The paving should be laid so as to present a practically waterproof surface, and should have frequent sewer connections for the removal of rain and excess sprinkler water.

Certain extensions and changes in the tracks must naturally be the result of a thorough re-routing of the system. Car houses, in some cases, should be relocated and improved repair facilities must be provided for the larger steel constructed cars, which should eventually replace the small single truck wooden equipment now used on many of the lines.

Experience is showing that the best way to avoid electrolysis is by means of an adequate return circuit and electrically connected rail joints of a current carrying capacity fully equal to the rail itself.

A long catalogue of defects which should be remedied, and of improvements in the system which should be effected, could be prepared, but *until the financial part of the program has been determined upon,* a detailed list of requirements will be of little use.

Depreciation and Renewals.

Depreciation, like interest, works every hour of every day, and with a street railway property, at a rate on the whole value of the property of about half the present interest rate. In making the combinations which resulted in the system now operated by the Pittsburgh Railways Company abundant attention was given to the question of a return on the investment in the shape of interest and guaranteed dividends, but apparently no provision was made for taking care of that equally important item—depre-

ciation. The result is—a property which is now ready for renewal in many of its parts, and neither the lessors nor lessees seem to be prepared to assume the burden of replacement cost. But whatever the method devised for taking care of cumulative or *past* depreciation, there should be adequate provisions in the *future* program for handling the property to take care of *current* and *future* obsolescence and the other forms of deterioration which cannot be offset by ordinary maintenance and regular upkeep.

Re-Routing and Improved Schedules.

The question of transfers, through routes, downtown loops, terminal facilities, location of car houses, use of trailers, and the equitable distribution of cars over the various divisions to take care of the constantly shifting demands for service, are all important questions which need extensive study and can be best settled in a spirit of co-operation between the City and the Company. Preceeding final decision on these questions however, there should be a definite settlement of the question of what proportion of the income from passenger earnings is to be returned to the system in the form of operating expenses to provide service. The determination of this question would allow the settlement of the other problems on a reasonable basis which could be maintained even if the original conditions are altered.

Adequate Service.

The requirement of *adequate service* has been mentioned last, but in reality it is *first in importance*. Above all else the whole transportation arrangement should be devised to provide "adequate service", for the growth of the community depends upon convenient inter-communication between all its parts. Just what constitutes adequate service is not easy to define. The actual service supplied is necessarily affected by the amount of the investment, the rate of return on this investment, and the cost of operation including renewals. If all these factors are accurately known, then adequate service might be defined in terms of the income or fare, that is, a given fare would mean a corresponding service;—raise this rate of fare and the service could be improved. But to reach a conclusion as to adequate service by this method, means first—an official appraisal as to the value of the property, both of its "cost to reproduce" and the depreciated or "present value," second—an official decision as to the rate

of return to be allowed on this value as well as upon all new capital required for rehabilitating the property, and for extensions and for betterments, and third—some system of public record which will make it possible for an authorized check to be made upon the cost of the property, the service supplied and the cost of operation from time to time. Such an arrangement has been the result of the "settlement" in Chicago and in Cleveland, and a similar state of affairs exists in Boston, where the State Railroad Commission has supervision over the operation of the railways. In Pittsburgh, however, where no system of direct public supervision exists, the only answer that may be given at present to the questions "how much service can the Pittsburgh Railways Company afford to give under the present conditions?" is to compare the results of operation in Pittsburgh with the results for those cities where some form of regulation exists. Such a comparison shows the relative proportion of income that is returned to the riders in the form of operating expenses or the equivalent of service as follows:

OPERATING EXPENSES IN PERCENT OF INCOME.

	Operating Expenses Not Including Taxes or Depreciation
Boston	66.76%
Chicago	63.20%
Pittsburgh	59.92%

According to these figures, the riders in Pittsburgh are getting back 60% of their nickel, or three cents out of every five in the form of service, while the Chicago rider gets 63%, which is 5% more than Pittsburgh's rate, and the patrons of the Boston system get 66%, which is 11% better than in Pittsburgh. Looking at it from another standpoint, that of the relative returns to the Company, the record is as follows:

COMPANY'S SHARE IN PERCENT OF INCOME.

		Fixed Charges, Dividends and Surplus
Boston		25.82%
Chicago		23.92%
Pittsburgh	32.63%	
Deficit	13.21%	45.84%

These figures show that in Boston and Chicago, the properties are financed with a return on the investment equal in amount to an average of about 25% of the income. The demands of the financial plan of the Pittsburgh system are that 45.84% of the

NOTE.—The percentages in the two tables will not add up to 100% for each city, as the first table does not include percentages for taxes and depreciation.

income be taken for "fixed charges", although the actual amount available out of last year's earnings was about 32.6% leaving a "deficit" of 13.21%. It will thus be seen that the "fixed charge" agreements with the Pittsburgh system are a serious handicap in securing adequate service in the Pittsburgh District.

Financial Requirements.

The financial requirements of the Surface System which are of the first importance may be recapitulated as follows:

1st—To procure sufficient funds for *rehabilitation* in order to offset *past depreciation. This rehabilitation must be accomplished without increasing the amount of the present capital.*

2nd—To provide an adequate renewal fund for current and *future* depreciation out of earnings.

3rd—To secure and protect *new capital* for present and for future betterments and extensions. This capital should be forthcoming from time to time to provide for constantly growing transportation needs and should be available somewhat in advance of actual demands for increased service.

The above financial requirements for a successful transportation system are not theoretical, as the financial necessities of the Pittsburgh system are not different from those of other electric railway systems where the above requirements and arrangements have been found advisable and practicable.

In Chicago, the solution has been worked out to meet the above requirements, but in doing so, a complete financial reorganization of the surface traction companies was necessary. An appraisal was made, establishing the actual depreciated value of the property, and ordinances which were passed nearly four years ago provide that (a) 70% of the passenger earnings shall be set aside during each of the first three years (the agreed period of rehabilitation) for furnishing service, paying taxes and taking care of maintenance and depreciation, (b) from the remaining net earnings, an amount is set aside to pay interest at the rate of 5% on the agreed appraised value of the property as well as upon all amounts spent for rehabilitation, betterments and extensions, all as passed upon by a Board of Supervising Engineers, and (c) a division of the remaining net earnings is made on the basis of 55% to the City and 45% to the Company. This 55% is reserved by the City in a special fund, which is to be used exclusively for future traction developments.

The Chicago ordinances therefore fully comply with the above financial requirements, and the result of the operation under the reorganized arrangement is better service with a rehabilitated and improved system, and at the same time a fair return to the railway companies on their actual investment. During the past three and one-half years about $55,000,000 has been spent in rehabilitation and betterments of the surface railway system in Chicago, and the City's share of the earnings during this time has amounted to about $5,000,000.

In New York the efforts to establish the surface traction system on a substantial basis has resulted in receiverships for the more important companies, and the properties are now being largely rehabilitated out of earnings at the expense of interest and dividend obligations, but the questions of the protection of future capital and the depreciation fund for renewals are still to be determined. However the orders of the Public Service Commission place *adequate service ahead of all other requirements.*

In Cleveland the new traction ordinances involved a valuation of the surface railways and a 6% return on this valuation, and an effort is being made to operate for a fare lower than five cents. The outcome, however, is still in doubt. Service, in Cleveland, is said to be still unsatisfactory, extensions have not been definitely provided for and requirements for depreciation are apparently still to be determined.

Difficulties in Pittsburgh.

In Pittsburgh, the difficulties to be overcome before a logical, financial program can be complied with are many, including the following:

(a) *The Leases.* A large number of the underlying properties were brought into the present traction system at a time when the earnings were increasing at a remarkable rate, and at the same time the expenses of operation were lower than at present, or perhaps had been reduced purposely to make a good showing. In addition, the present holders of the property were very desirous of securing monopoly control of the traction situation. The result was that the guaranteed rentals on a large part of the holdings were much higher than they would have been if the leases had been executed with the present day knowledge of the actual situation.

(b) *Renewals unprovided for.* At the time the combination was made, the practice was in vogue of charging all renewals to capital account, in other words, depending on *appreciation* to

take care of depreciation. It has been since demonstrated that earnings have not increased at a rate sufficiently rapid to take care of increased service as well as constantly increasing cost of operation and the demands of a pyramided capital account. *The fact that only a small part of the necessary renewals have been provided for out of earnings in the financial accounting of the company is the fundamental defect of the system.*

To correct this defect and at the same time meet the demands for adequate service and new capital for improvements, is the main financial problem. Experience with other properties would indicate that if new capital is to be used for rehabilitation, then the old capital account must be reduced by an equal or even larger amount, or if the *future* earnings are to be called upon to supply funds for *past* depreciation, then the future return on the present actual investment in the property must be reduced by a corresponding amount. *In other words, if a reorganization with a reduced capital is impracticable, then future dividends must be sacrificed or reduced until the property is brought up to full normal operating efficiency, and the profits at one time expected in addition to actual interest requirements must be deferred until the density of traffic considerably increases.*

The old order of financial requirements *during the promotion period* was—1, Profit,—2, Service—3, Maintenance with no provision for Depreciation. The new order for *established** public properties should be—1, Adequate service—2, Maintenance and renewals—3, Interest on actual present investment—4, Protection for new capital and—5, Profit. But before this order can be established, the problem of what to do with past depreciation must be solved. To do this, the first effort must be to have the *actual owners* of the property provide the money for rehabilitation either by advancing it out of past profits or by agreeing to reduce dividends in the future until the rehabilitation fund is provided. If neither of these plans are practicable, then the property should be reorganized starting with its present *depreciated* value and adding to this value, the *amount necessary* to *rehabilitate the property* with suitable provisions for maintenance, renewals and extensions.

(c) *The Holding Companies.* As a matter of fact, the Pittsburgh Railways Company would have failed long ago in carrying its burden of fixed charges if it had not been for the holding company, The Philadelphia Company and the holding com-

*That is a property which is in operation and has demonstrated its ability, to give adequate service and earn reasonable fixed charges upon a fair valuation.

pany to the holding Company, The United Railways Investment Company. A large part of the stock of the Pittsburgh Railways Company and of the underlying companies comprising the system which it operates, is owned by The Philadelphia Company, which also owns valuable gas and electric properties in Pittsburgh that are apparently on a paying basis. The result is that the deficit of the Pittsburgh Railways Company is carried as a floating debt by its parent company, the Philadelphia Company.

(d) *Perpetual Franchises.* Most of the franchises of the underlying companies of the Pittsburgh Railways Company are claimed to be practically perpetual, in other words, there is no period of expiring franchises to be anticipated at which time new arrangements could be entered into that would include requirements for adequate service, public control and provisions for renewals out of earnings, which more mature public opinion will demand. In the meantime the Companies justify their capitalization at a figure considerable in excess of the actual physical value of the property including reasonable development expenses by the value of their *perpetual* franchises. To defend this position, they must naturally deny the right of the community to regulate its service, to fix the fare or to demand transfers. Public opinion and legislation has not yet progressed far enough in the State of Pennsylvania *to definitely* secure for the local community the right of public control of service, of rates and records, and therefore the traction situation in Pittsburgh is still complicated by the "rights" of perpetual franchises.

A Reorganized Surface System.

The Surface System will continue to be unsatisfactory in its operation until the present leases are cancelled and the various properties reorganized into one system on the basis of their actual present value. Money to rehabilitate can then be invested on the same basis as capital for betterments and extensions and all *actual* investments can be assured a fair rate of return. Future depreciation can be taken care of by an equitable division of income between the requirements of service, maintenance, renewals, damages, taxes, interest and profit. To maintain such a balance, a competent regulating body will be found necessary to determine standards of construction and equipment, to control and check expenditures and to regulate service. Until the Railways Company, the City officials and the citizens of the Pittsburgh District have succeeded in working out some such equitable balance, the surface railway situation will continue to

be unsatisfactory. *Immediate efforts should therefore be made to develop a comprehensive program for reorganization, for rehabilitation, for a protected actual investment, for adequate service and for public control of the present surface system.*

III. FUTURE RAPID TRANSIT DEVELOPMENTS.

The Pittsburgh District must look for real "rapid transit" from (a) the building of subways and (b) the electrification of the steam suburban lines.

Elevated roads have been suggested for both the operation of the present surface cars and as a separate system, but as other communities now having elevated structures in their streets are making efforts to do away with them in favor of sub-surface construction, it is reasonable to assume that the future building of elevated structures for urban transportation is limited, particularly in downtown or congested sections.

Subways in Pittsburgh.

Subways, will in the course of time, become desirable and even necessary in order to relieve the congestion of cars from the surface of the downtown streets, and in order to overcome the topographical disadvantages of hills and rivers which now divide the city into a number of separate communities. However the advantages of a subway system from the standpoint of "rapid transit" will be but incidental, as the sub-surface routes cannot be long. If the surface system is improved as it should be, the time required for the average ride on the trolley will not be excessive, and the fact that so many home communities are within thirty minutes by trolley of the business district makes the popular demand for subways in Pittsburgh less than in other communities not so favored.

The fundamental need of subways in Pittsburgh is to provide downtown terminals for electric suburban systems. To secure sufficient capacity to justify the investment the cars should be run in trains, and a transfer arrangement should be worked out so as to use the surface trolley system for collecting and distributing passengers throughout the districts contiguous to the subway or other rapid transit routes. Considerable study should be given to the question of the exact location of the subway route and its terminals before final conclusions are made.

Subways should be built with money secured at the lowest possible interest rates. If private capital can be interested in a return of 5% and the financial arrangements can provide that the cost of the subway be amortized out of earnings (in such a way as to eventually become the property of the City even at the end of a long period) then the building of a subway by private capital is not impossible. But if private capital must have 6% interest, and to the actual cost of construction must be added any considerable amounts for promoters profits and for development expenses, then it will probably be found better for the City to secure legislation which will enable low interest bearing bonds to be issued independent of the City's debt limit for the purpose of building a City-owned subway and thus relieve the subway of excessive fixed charges.

Electrification of Steam Roads.

Reference to the maps showing the steam lines (*a*) in the Pittsburgh District and particularly the map indicating the number of seats (*b*) in one direction during one rush hour on each steam line as compared to the rush hour seat map (*c*) of the surface trolley lines will show that the steam lines perform no inconsiderable part in the transportation of passengers in the District. The seat map (*b*) also discloses the fact that three of the lines do the largest share of the suburban business and all are Pennsylvania Railroad lines.

An examination of the "time zone" map (*d*) shows that, as far as time is concerned, the present suburban steam lines are giving very fair rapid transit on their express trains. The drawback to this service, however, is its comparative infrequency and the lack of convenient downtown terminals. These two disadvantages can be corrected by electrifying the lines and using a subway route through the business center, and then the present railroad locations—allowing the operation of trains in the open air—and already serving the main suburban centers of the District, will be found particularly adapted for real rapid transit purposes.

A Comprehensive Plan.

The first requirement of future rapid transit developments is that, from beginning to end, each part should fit into a carefully designed, comprehensive plan. As far as can be anticipated at the present time, this general plan should use the surface system as a

a–See insert, page 86- 87
b– " " " 86- 87
c– " " " 162-163
d– " " " 86- 87

convenient collecting and distributing medium for short hauls and the electrified steam lines and similar trunk lines for the more rapid long haul business. This will leave the subways to furnish convenient terminals for preventing congestion on the streets in the central district and for through connections under the rivers to relieve the bridges and more effectively unite the three sides of the City. The entire system should be technically under one control and the transfer principle should be made use of to insure the most efficient density of traffic for each type of transportation.

IV. LEGAL DEVELOPMENTS.

As this report is primarily a study of the technical requirements of the transit situation in Pittsburgh, it is not intended to include more than an outline of the legal methods or program for securing the results. The task of producing a comprehensive system includes technical, legal and financial problems, the solution of which must proceed simultaneously and each may be said to be equally as important as the others.

From a *legal* view point, it would seem that the developments should be (as near as can be outlined in advance) along the following general lines:

First. In order to prepare for and finally arrange a reorganization of the present system which will be fair to both the City and the Company, a complete investigation should be made into the corporate history of the present system, either by the Secretary of Internal Affairs or by a properly authorized Commission. The record resulting from this inquiry should show all the facts as to charters, franchises, agreements, leases, operating agreements, issues of stocks and bonds, the amount and distribution of earnings and all other information that should be a matter of public record.

Court decisions should determine the present status of all charter and franchise requirements which are not being carried out in regard to taxes on earnings, car licenses, street cleaning, paving maintenance, etc. In order to prevent any decisions or legislation which would tend toward confiscation of the property, arrangements should eventually be made for an official valuation of the property, but this valuation should not be made until the results can be definitely used in a final settlement.

Second. In order to secure for the Pittsburgh District the latest development in connection with the *Public Control* of *Public Utilities,* the Railroad Commission Act should be amended so as to secure as broad powers as have been delegated to the Public Service Commissions of other States covering the questions of capitalization, adequate service, rates, extensions, transfers, routing, joint use of property, renewals, and standard systems of records and accounts.

A Public Utility Bureau of the City should be authorized to accumulate information and to check the quality of service supplied by all public utility corporations; this information to be used as a basis for improvement and future regulation.

Third. With the idea of equipping the present City with machinery which will enable it to ultimately have complete control over its transit facilities, legislation should be prepared and passed as soon as practicable which will give the City the right to issue self-supporting bonds, independent of the debt limit for the purpose of building and operating or leasing *subways* and other *rapid transit* facilities.

The limits of Pittsburgh should be extended so as to include as much as possible of the surrounding industrial and residence communities in a way to provide a centralized control of all public utilities and improvements, and for this Greater Pittsburgh, the ultimate right to purchase, build and operate *all* necessary electric transportation systems should be secured and placed under the supervision of a properly qualified and authorized Transit Board.

THE TRANSPORTATION PROBLEM.

General Discussion.

Outlining the general scope of the problem presented—The necessity of considering individually the various conditions arising in each traction center, —The desirability of a comprehensive program of development—The inter-relations existing—The patron—The operator—The City—The real estate owner—How financial requirements dictate a fair return and a division of burdens,—How a broad economic policy should hold transportation as essentially a monopoly to avoid the evils of wasteful competition —Traffic density prescribing type of construction—How short haul and high density reduces transportation costs per passenger—Reduction in service resulting from excessive taxation—Franchise values misunderstood —Depreciation reserve a necessity—Street railway no longer a "gold mine"—Rate of return now on a conservative basis —The problem of finding an equitable balance—Present tendencies toward basic physical valuation —Extensions by assessment—High standard of service —Cheap fares no longer the greatest need—Abolition of the abuse instead of the use of transfers—City participation in financing and returns.

Pittsburgh's traction problem, like those of other cities, can not be settled now, for all time to come, on account of the increasing demands which will arise from time to time under new conditions; but it has been found in other cities, that an educated public opinion regarding transportation matters has assisted greatly toward adjusting and maintaining the proper relationship between the traction companies and the riding public. It is for the purpose of bringing out a comprehensive statement of the entire problem before analyzing each element in detail, that this general discussion, preceding the other parts of the report, is submitted.

A study of the transit facilities of Pittsburgh, as well as of all the larger American cities, shows that while great advances have been made in the art of transportation, much remains to be accomplished. Nearly every city encounters a different traction problem, and many of them are pressing for some immediate solution. In the majority of cases, what is wanted is not only considerable improvement over present conditions, but also a program of development along technical, legal and financial lines which will result in a comprehensive transportation system suitable to meet constantly growing demands.

Points of View.

The term "comprehensive plan" is used so frequently that it may be worth while to define the conditions which such a plan should fulfill. In doing this, it will be discovered at once that there are many points of view, and equally as many opinions as to the relative importance of the elements which enter into the specifications for an ideal system of transportation. In considering the subject, the rights of the patron, the operator, the municipality, the property owner and the financier must each be recognized as well as the requirements for maximum economy.

The patron of the system believes he has a right to expect adequate service, consisting of plenty of cars provided with cross seats, comfortably heated in cold weather and well ventilated at all times. Every precaution should be adopted for his safety, and after safety and comfort has been secured, the maximum possible speed should be the next consideration. The rolling stock should be noiseless in operation, and the track, special work and car equipment should be built for easy riding. Through riding from point of starting to point of destination is desirable, but if this is not possible, the patron expects universal transfers and one fare for the entire system.

The operator of the system can secure the best results if the equipment is efficient and up-to-date, if the construction has been sufficiently substantial to reduce maintenance to the most economical point, if the track and paving have been built so as not to encourage vehicles to follow the rail, and if street traffic is so regulated that the surface cars will have the right of way, particularly during the rush hours.

The most favorable conditions for operation exist when the peak loads are not excessive, when there is a large amount of all-day travel, when the flow of traffic is not all one way so that the cars may be evenly filled in both directions, and when the profit

of the short haul business more than offsets the losses from the long hauls.

The City is best served if the passengers are collected and delivered convenient to places of business; and the system should carry passengers to the outlying districts in the minimum of time and at the lowest cost, so as to reduce the tendency toward congestion in down town districts. Rapid transit should be provided by well ventilated subways or by means of roads in open cuts, or upon elevated structures designed to present an artistic appearance and to operate with a minimum of noise. Suburban traffic should be handled by electrified terminal systems of the various steam roads so as to avoid smoke and gases.

The street railway surface system is expected to maintain the paving between and adjacent to its tracks and to sprinkle the streets and reconstruct its roadbed whenever the streets are torn up for changes in grade, alterations in pavement, new sewers or water mains. Free transportation should be supplied to mail carriers, firemen, policemen and other city employees, and special low rates should be made for school children and workmen. Iron poles should be removed upon request and all transmission and feeder cables should be placed underground. In certain cities and in restricted districts of other cities, the underground conduit system is insisted upon. The franchise should be indeterminate so that "franchise values" will be eliminated, and a system of regulation should be established to insure that the citizens get their full measure of service.

The real estate owner and promoter often insists upon the best facilities being provided for his immediate district, even at the expense of the remainder of the city. The owner of property in the central part of the city will point out the advantages of confining the growth of the city by restricting non-paying extensions and by charging two or more fares to reach the outlying districts; while the development of the suburban districts and the building up of home communities inside the city limits depends largely upon extensions of rapid transit facilities and the maintaining of the universal five cent fare.

Financial requirements will dicate that the rate of fare be sufficient to cover the expense of transportation, maintenance, reserve for depreciation and damages, as well as to pay interest charges and a fair return on the investment. If there be any surplus, the excess earnings should be devoted to better service and extensions, or it should be divided with the city in lieu of taxes, franchise payments or other civic burdens.

In considering rates, credit should be allowed for past burdens of non-paying years and for development expenses involved in creating, combining and building up the property and in bringing it to a paying basis. Extraordinary expenses should be amortized, and reserves for replacement of equipment, personal damages, fires and other contingencies should be provided.

A broad economical policy requires that the whole transportation system of a district should be controlled as if under one ownership, and that when one system of transportation more efficient than another can be provided, a transfer of passengers should be encouraged from the less to the more efficient system. *Transportation in a city is a natural monopoly; therefore no district should be served with two competing transit systems when one can furnish better service than with the business divided.*

The building of extensions into undeveloped districts should be assisted by assessment on the property benefitted, and the operating loss on non-paying lines should be financed so as not to be too heavy a burden upon the remainder of the system. As districts develop, the improvement of transit facilities should be somewhat in advance of the actual requirements.

Equitable Balance.

The problem, therefore, is how to find an equitable balance between all these conditions. There is to be provided a maximum of safety, comfort, speed and capacity. Pavements are to be repaired, taxes are to be paid and all equipment must be thoroughly maintained and a reserve fund accumulated so as to keep the property abreast of all advances in the art. Separate systems must be controlled or combined to avoid wasteful competition and to secure the efficiency of one management. Extensions must be made into promising territory. Rapid transit systems should be provided for and built in advance of immediate needs, and the losses during the first years of operation must be financed. If private capital is to be attracted for building transit systems, a return on the investment somewhat larger than current rates of interest should be allowed.

There are so many elements arising from local conditions that it is quite impracticable to develop a formula that would be universally applicable, and while comparisons between different cities are instructive, the solution of *any one problem* must be preceded by a study of the relative importance of its elements as determined by the special requirements of the given locality. In each case it is desirable to determine what constitutes a fair requirement of the following items:

1. Original investment.
2. Legal, technical and financial development expenses.
3. Working capital.
4. Adequate service.
5. Probable income.
6. Operating and maintenance expenses.
7. Taxes and franchise payments.
8. Reserve funds for insurance, damages and depreciation.
9. Rate of return on actual investment.
10. Provision for future improvements and extensions.
11. Facilities for rapid transit.

Transit facilities may be called the blood vessels of the city or district, and it is only by providing for unrestricted flow of traffic from any one district to every other district that we have the most favorable conditions for strength and growth. Hamper this free intercourse by poor transit facilities; at once there is an arrested development. On the other hand, if facilities are extended too far and too fast, there follows a dissipation of strength. What is always wanted is to find an equitable balance, and then a constructive program which will *continuously maintain* this balance.

Present Tendencies.

It may be of benefit to indicate briefly the present tendencies which are more or less marked in the movement for transit betterments. There is a decided tendency, for instance, toward recognizing the *actual investment required to provide adequate service.* This tendency is shown by the valuations of traction properties which are now under way by various authorities and by the studies that are being made by engineers to determine not only the first cost and the "cost to reproduce" certain properties, but also the probable additional expenses which have been involved in building up the property and securing a good business. It is hard to see how the problems of reorganization and of rate making can be fairly handled without making a fair determination of the reproduction cost, and in some cases, of the depreciated or present value.

There appears to be a constantly growing sentiment in favor of building *extensions into new territory by means of assessment;* that is, charging the property benefitted with at least the cost of the permanent way. This method of financing branch lines which will be operated at a loss for some time, has been worked

out in Berlin in connection with the underground road, and petitions are now being signed in certain districts of New York which are likely to result in its adoption in this country.

There is also a gradual tendency toward a *higher standard of service.* Better lighted, better heated and more comfortable cars are in demand and limiting the crowding allowed is resulting in more adequate service. While it is generally recognized in this country that a seat for every passenger is impracticable during rush hours, knowledge of the fact that such a policy is possible in foreign cities seems to justify the more insistent demands for more seats here at the time passengers wish to travel.

Fares.

There has been some demand for *three cent fares,* especially in the middle west, and experiments are now being made to determine the possibility of this fare. The results, however, are tending to prove that cheap fares and good service cannot be secured at the same time which points to the conclusion that, as a rule, if the rider wants good service he must be willing to pay reasonably for it.

On the other hand, the movement to *raise the city fare* above the five cent limit has received little encouragement; and there seems to be no decided sentiment in this country in favor of the European zone system. It appears that a concerted effort must be made to work out our transit problems on the basis of a single five cent fare for a ride in one general direction. And it will probably only be when failure to do this, due to excessive length of average haul, has been demonstrated, that it will be advisable to consider raising the fare above five cents. Then it will probably come in the form of making a small charge for certain transfers. In other words, of all the possible solutions, the augmenting of income by charging more than five cents for a ride within the city limits would appear to be one of the last suggestions to be considered.

An effort has been made elsewhere to increase income by *abolishing free transfers,* but there is a question as to the benefits to be derived from such a course. The *abuse* of the transfer privilege should rather be eliminated. Its intelligent *use* always has been a logical and economical method of handling and increasing traffic. The tendency should be toward one comprehensive system with consistent transfer facilities between the different branches.

If the collection and distribution of passengers can be accomplished more conveniently and economically by means of the transfer than by means of *the "direct" system,* which often means the duplication of service, then the transfer system should have the preference.

When it is understood that the operating expenses per car mile are from three-quarters to one-half as much per car for a subway or an elevated structure as upon the street surface, and that at the same time the subway or elevated car runs at fully double the speed and carries at least 50% more seats, it will be seen that, as far as operating expenses are concerned, rapid transit subway and elevated lines have a great advantage. The problem is to *secure sufficient business* to run enough car miles over the more expensive structure so that the fixed charges *per car mile* will not be excessive. As a rule, any subway or elevated system will not prove financially successful in which the car miles run during any year are not equal in amount to at least half the investment in dollars then in the property, (that is, an investment of two dollars for each car mile on a yearly basis). Experience is gradually showing us that there are economical limits—both high and low—between which a certain density of traffic will justify a corresponding transportation system; beyond these limits some other system should be provided. For instance, in Boston, when the surface system became congested with traffic in the down town districts, it was found more economical to handle passengers on an elevated structure. In the course of time, as traffic increased, it was found desirable to extend the limits of the elevated road zone and to use subways. The same conclusions are being reached in Brooklyn, where as in Boston, the elevated and surface roads are both under one management. In other words, a unit system of construction is naturally being developed together with a *zone system of operation rather than a zone system of fares.* But this is only possible when the entire transportation system is practically under one control.

Short Haul and Density.

The fact that the operating expense per car mile of the surface lines is greater than the cost per car mile through a subway or on an elevated line, naturally leads to a more serious study of the possible economies in surface line operation. Progress in this direction shows a decided movement to reduce the relative weight of the car per seat, resulting in lower power costs and less annual cost for maintenance of roadway. At the same time, the income is being increased and conserved by the intro-

duction of improved fare collecting systems. There remains to be devised, however, some system of operation on the surface lines for the handling of *short haul passengers in short haul cars.* There is a large profit in all of our cities from the short haul business. But as a rule, it is now being handled in cars which run practically to the ends of the various lines so that much of the advantage of the short haul profits is offset by the expense of operating cars with empty seats in the outlying districts.

It must be recognized that there are two things which reduce the cost of transportation per passenger—one is *density of traffic* and the other, *short haul.* In Paris, the subway system is a paying investment, because the average haul is less than two miles and the cars are operated over comparatively short lines. Universal free transfers are provided over the entire system but the lines are not physically connected and the longest haul is handled by trains running only six miles, at the end of which distance, they are looped back. On the other hand, the present subway in New York furnishes a continuous ride of seventeen and one half miles for one fare, while the average passenger travel is about five miles. Taking into consideration the relative purchasing value of money in New York and in Paris, a comparison of the two cities shows that in the Paris subway, the fare is equivalent to four cents for an average ride of two miles or at the rate of *two cents per mile,* while in New York, the fare is five cents for an average ride of five miles, or at the rate of *one cent per mile.* On a mile basis, therefore, New York gets its subway transportation at half the Paris rate, but the New Yorker travels more than twice as far on each ride as the Parisian, so that the average fare *per passenger* is greater in New York than in Paris. New York has the advantage of density of traffic; Paris has the advantage of short haul. New York should cultivate the short haul business in short haul cars as is done in Paris and enjoy the benefits of both elements—short haul and density of traffic—and thus be relieved of the present uncomfortable overcrowding in the short haul district which now seems to be necessary in order to secure the very long rides for a universal five cent fare.

Taxes.

The question of taxation is being more carefully studied and it is being recognized by some students of transportation problems, that perhaps the railroads have been called upon to carry more than their share of the tax burden. For a time, the only apparent method available for the people to get their

share of the profits, often imaginary, derived from the railway business, was by means of taxes. Hence special taxes of various kinds were devised. But as logical methods of control and regulation are being introduced and as the records of investment, earnings and operating expenses are being more intelligently studied, this fact is becoming apparent—that there is very little surplus left for taxes, (particularly for the payment of a franchise tax,) if a company is to furnish adequate service, properly maintain its property, provide for depreciation due to renewals and obsolescence and pay even a moderate return on the investment so that needed extensions may be financed.

As legislatures can establish Commissions which have power to regulate service, control operation and fix rates, there apparently is nothing left, under such conditions, of what has been termed "franchise value." In fact the term "indeterminate franchise" implies this very feature. Now if there is no franchise value, there should be no tax upon it. The burden of maintaining paving is an inheritance from horse car days, when the horses used in hauling the street cars, actually wore out the pavements between the rails. And there is justly a growing sentiment toward the removal of this burden, providing of course that the money saved to the railway company is diverted to furnishing better service or toward offsetting some of the other legitimate expense of transportation.

Depreciation.

There is much discussion as to setting aside each year out of earnings, some definite amount to offset the depreciation of the property due to obsolescence and other causes; and it is generally conceded that *this is a duty and necessity that no longer can be neglected*. What should be done with the past obligations of this nature which have accumulated through years of development of poor business, is a problem which is receiving much consideration, but there hardly have been sufficient decisions reached to outline a final conclusion or even to indicate a decided tendency.

Rate of Return.

It is certain, however, that as all these requirements of successful and growing transportation systems are being more thoroughly analyzed and understood, that there is being developed a conclusion that the profits from the transportation busi-

ness are, as a rule, no longer excessive; and the removal of the idea that a franchise for a street railroad in a center of population is "as good as a gold mine" is having a good effect toward reaching a sane solution of transportation difficulties. Money actually used to produce a property should be assured a fair rate of interest, and if private capital is to be attracted, an additional profit over current interest rates must usually be allowed varying in proportion with the hazard of the enterprise. It must be admitted, however, that under conditions where the enterprise has become established, the fair rate of return considered necessary is approaching nearer and nearer toward just the interest charge at current rates; and the surplus earnings are being called upon to satisfy the demands for extensions, for effective maintenance and for reserve to cover depreciation.

The rate of interest is being reduced in some places by raising money for rapid transit systems by means of city credit, but in these cases, the furnishing of the money required for equipment and for the operation of the system has been left to private capital. In other cases, as in Chicago, the actual investment in the surface street railway system has been determined by appraisal and an exact accounting has been made of the expenditures for rehabilitation, betterments and extensions. Thus in Chicago, on the total investment, there has been allowed a return of 5%, plus a share of the profits, amounting to 45% of the net earnings, the other 55% going to the city. In other cities where the relation between the investment and the return has not been so carefully determined, there is a tendency either to force a reduction of the rate of fare or else an increase in service rendered.

It also must be recognized that if some method were available to absolutely keep the operation of the road "out of politics," there would be a decided tendency in some cities toward municipal ownership and municipal operation.

Recapitulation.

It will be seen from the foregoing that any attempt to formulate decisions of a hasty or prejudicial nature would very likely fall far from the truth and that a coherent solution of the problem requires analysis from many viewpoints and by various minds.

The patron should learn to recognize that empty seats cost as much to operate as occupied seats, that a seat for every passenger during the rush hours must mean the curtailment of the service during the non-rush hours, and that new cars and new tracks cannot be furnished until old equipment has been in service a reasonable length of time.

The operator should adopt the policy of continually trying to please the public and should arrange his schedules and routes to accomodate the greatest number. If the best service can be rendered by establishing through routes and giving transfers, these methods should be adopted in an effort to increase gross earnings by making it easy to ride. *It should be realized that publicity of intention and results is the best policy.*

The City should co-operate with the company on street traffic regulation, widening the streets where necessary and issuing permits for extensions and new connections which are absolutely necessary for the best routing system. Unnecessary taxes and the burden of paving maintenance should be removed so as to allow more money for betterment of service.

The property owner should recognize that the general prosperity of the entire district is not only vital to him but to others, and that routes and extensions cannot be controlled for his particular benefit.

The financier must realize that the day for exploitation of established public enterprises has passed and that the fixed charges on such properties must be reduced to a fair return on the actual investment. New capital which is absolutely necessary for the continued life and usefulness of any public utility must be furnished, and this flow of new blood should be supplied in advance of actual needs, if it is to have a strengthening influence on the system.

Economy and a continuation of an equitable balance dictates efficient management, and the setting aside out of earnings each year, of a fund to provide for renewals.

These several elements have been considered in some detail for the purpose of emphasizing as strongly as possible the danger of a one sided judgment of the Pittsburgh traction problem. And it is hoped that the reading of this general discussion will place one in a better position to consider the specific phases of the problem that will follow.

TRANSPORTATION IN THE PITTSBURGH DISTRICT.

Briefly discussing the importance of transportation to the Pittsburgh District—Pittsburgh always a transportation center by water and rail—Its enormous tonnage—A pioneer in electric traction—Pittsburgh not a city but a "District"—Its population of 1,000,000 scattered—Absence of a constructive plan in establishing isolated centers—Difficulties that may be turned to advantages—Transverse routes possible—Different types of cars best suited to trunks and hill climbing—Good service encourages traffic—One district, one system a necessity.

Pittsburgh owes much to transportation, and transportation to Pittsburgh. Its growth from the original Fort Pitt into a fortified trading post and later into an outfitting village was due to its location at the confluence of the Monongahela and Allegheny Rivers, forming the headwaters of the Ohio River, which early became the main highway between the Atlantic seaboard and the great West and Southwest.

Pittsburgh Always a Center of Transportation.

Very early, transportation was established overland by means of stage coaches with a line of Conestoga wagons for freight, making the haul from Philadelphia to Pittsburgh in 20 days. Later, to forestall competition on the north, the Pennsylvania canal was built by the State and brought the first boat into Pittsburgh in 1829 over an aqueduct spanning the Allegheny River. In connection with this canal, the Portage Railroad was built over the Allegheny mountains, hauling the entire canal boat over the divide by means of inclines. A very interesting print of Pittsburgh in 1830 shows the old "canal basin" Pittsburgh's first freight clearing house, on the site of the present Union Station with a tunnel piercing the "hump" so as to reach the final locks at the Monongahela River. This canal was eventually purchased and used by the Pennsylvania Railroad, and the tunnel is now used by the Panhandle tracks of the Lines West.

TRANSPORTATION MAP—PITTSBURGH DISTRICT.

A striking feature of Pittsburgh is the large number of industrial communities surrounding the city and forming what is known as the "Pittsburgh District." All of these towns are served by steam lines radiating from Pittsburgh, and most of them by lines of the Pittsburgh Railways Company. Lines designated as "Beaver Valley Traction Company" are not part of the Pittsburgh Railways System but are owned by the Philadelphia Company.

This so called Pittsburgh District lies largely within the limits of Allegheny County. The areas indicated by circles are proportional to the population of the various towns.

Steam ferries and river packets as far as New Orleans were established in 1810, and in 1818 bridges were built over the rivers to the North and to the South Sides. In 1836 river improvements were begun to facilitate navigation during slack water.

The steam railroad—The Pennsylvania—reached Pittsburgh from Philadelphia in 1854, and a steam line to Chicago was opened in 1859, the same year that the horse tramway was introduced in the city for hauling local passengers.

The early discovery of coal and later of petroleum and natural gas in the vicinity of Pittsburgh, made it a natural manufacturing location, and the development of its industries has made the "Pittsburgh District" one of the leading producing and transportation centers of the world.

The total railroad and river tonnage (not including freight in transit) amounted in 1907 to 161,194,000 tons, of which 14,396,000 tons was carried by boats. It is said that the tonnage of this District is equal to one-half the combined tonnage of the Atlantic and Pacific coasts, and exceeds the combined tonnage of London, New York, Antwerp, Hamburg and Liverpool. Pittsburgh has thus grown to be the center of a network of steam railroads and the home of a large and busy fleet of river boats.

While, during these developments, Pittsburgh has been calling for and receiving the best that the art of transportation has had to offer, it has not been slow in contributing in large measure to progress in this line. It was among the first of the American cities to introduce the horse car and the cable system and was a real pioneer in building electric street railways. The genius and industry of its workers has made Pittsburgh the home of the steel rail, the block signal, the air brake, the steel car wheel, the all-metal car, the electric motor and the steam turbine. Thus, while Pittsburgh owes much to transportation, it has paid its debts with interest and has a right to expect much of future transit developments.

The Pittsburgh District.

Pittsburgh is really not a City, but a District, and while there are "city limits" the study of the local transportation problem cannot be confined to these limits. Of the 581 miles of track comprising the present system of the Pittsburgh Railways Company there are 260 miles located inside the city limits, the remainder of the trackage serving the surrounding boroughs

and reaching out as interurban lines as far south as Washington and Charleroi.

Of the million people served by this system, only about one-half are to be found within the City proper. The Pittsburgh Railways Company makes no distinction in its accounting system between earnings and operating expenses inside and outside the city limits, which is another reason for considering the Pittsburgh District as a whole, rather than attempting to analyze the traction situation of the City only.

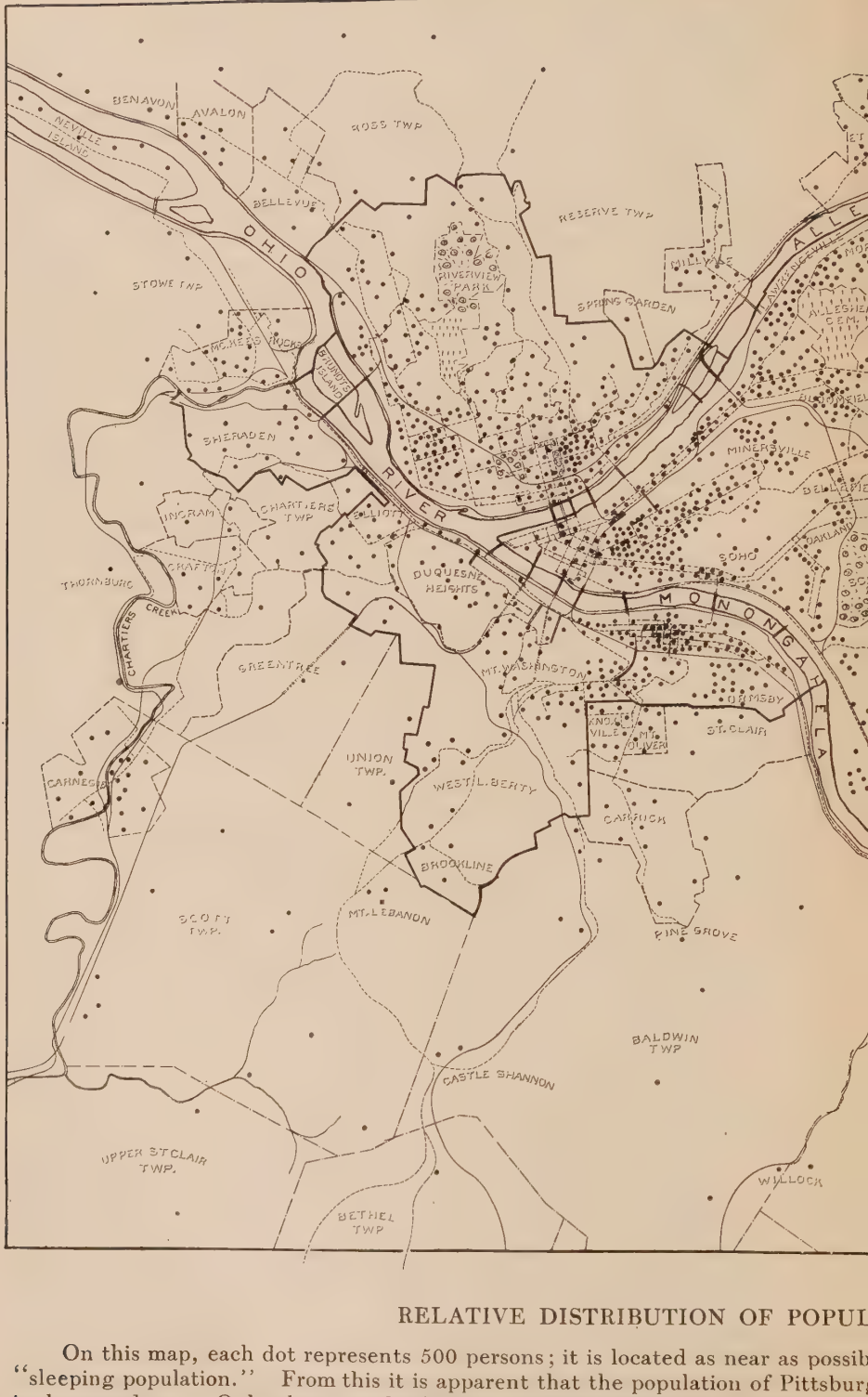
It will be found imperative, eventually, to handle the problems of water, sewage and other public utilities as a District rather than as a City, and as the prosperity and growth of any one locality has an influence upon the entire community, there should be no distinction made in favoring the transportation developments in any certain direction.

The system of the Pittsburgh Railways Company serves the entire District. There are small competing street car systems in some of the boroughs, such as Homestead and McKeesport, but nearly the entire population of the District depends for street car service upon the Pittsburgh Railways Company.

Population Scattered. The striking feature of the locality, from a transportation standpoint, is the scattered way in which the District has been settled. The entire city and the surrounding towns have simply "grown up" but not according to any definite or pre-conceived plan. Starting with the district lying between the rivers near their junctions commonly known as "The Point," industrial enterprise has spread out the workshops and the workers along the rivers and railroads, while the home-seeking spirit has carried the resident population up to the hill tops in an effort to get away from the smoke that has been inseparable from the city's progress toward its present greatness.

The effort to secure favorable transportation facilities has been the fundamental cause for the division of the District into somewhat isolated centers. Manufacturing necessities early preempted the few available level factory and mill sites along the river banks or in the valleys contiguous to the railroads. The houses of the workmen were perched on the hill sides or were clustered in the ravines nearby, and "The Point" became the natural administrative and commercial center of the District.

Isolated home communities sprung up along the lines of the steam railroads and small trade centers developed at these

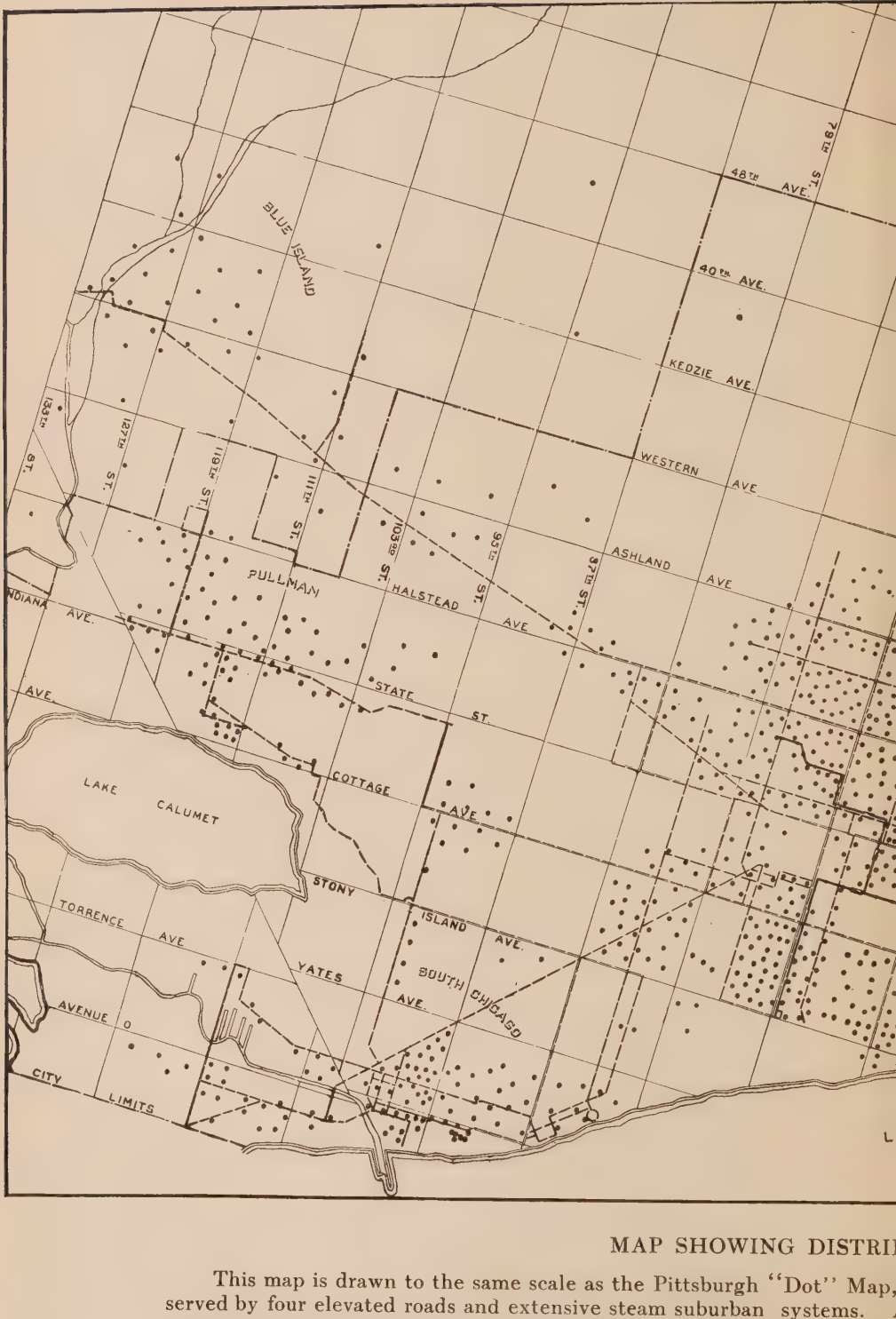


RELATIVE DISTRIBUTION OF POPUL

On this map, each dot represents 500 persons; it is located as near as possib "sleeping population." From this it is apparent that the population of Pittsbur ingly spread out. Only about one-half of the million persons served by the Pitt covers sufficient territory to accommodate many times its present population, bef

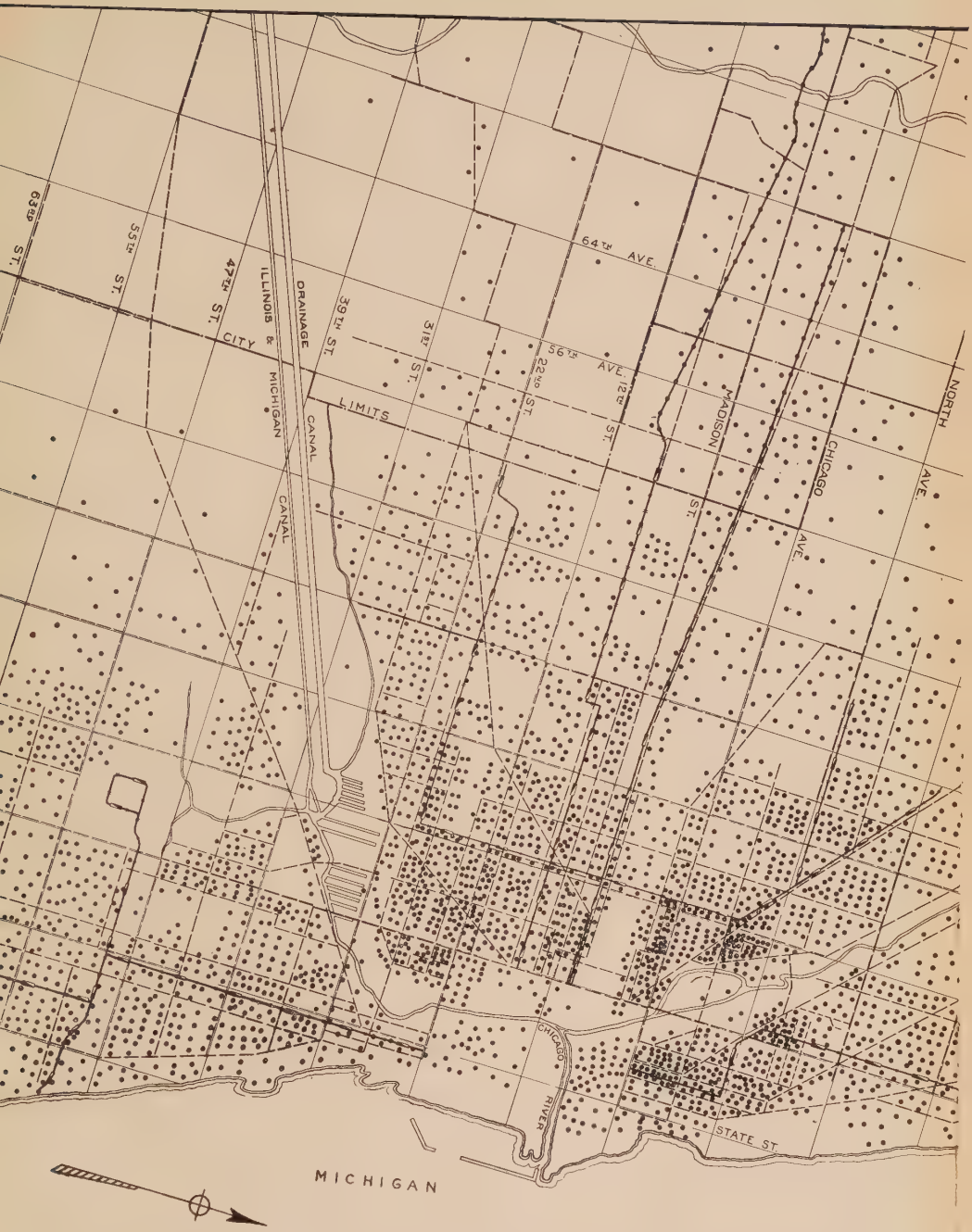
—PITTSBURGH AND VICINITY—1910.

center of residence, and therefore represents the approximate location of the
e District is scattered. Hence the surface electric lines have been correspond-
lways Company live within the City Limits. However, the Pittsburgh District
need be any congestion.



MAP SHOWING DISTRI

This map is drawn to the same scale as the Pittsburgh "Dot" Map, served by four elevated roads and extensive steam suburban systems. is served by a surface street car system with one five cent fare and many of the new traction ordinances to secure "one city with one fare."



OF POPULATION IN CHICAGO.

each dot also represents 500 persons. In addition to the surface lines, Chicago is considerably more scattered than Pittsburgh, a large portion of the city of Chicago n'' routes. A liberal system of transfers is also provided to carry out the provisions

MAP SHOWING DISTRIBUTIO

This map, drawn to the same scale as that of Pittsburgh and Chicago, and w
"built up." Berlin has an average density of 131 persons per acre, while Pittsb
acre. Berlin has its own transportation problem, but it is largely one of securing
systems are supplemented by many omnibus lines and by the "Ringbahn" and "

LEGEND

POPULATION ●=500

SURFACE RY

CIRCULAR RY

SUBWAY LINES

SUSPENSION RY

SCALE

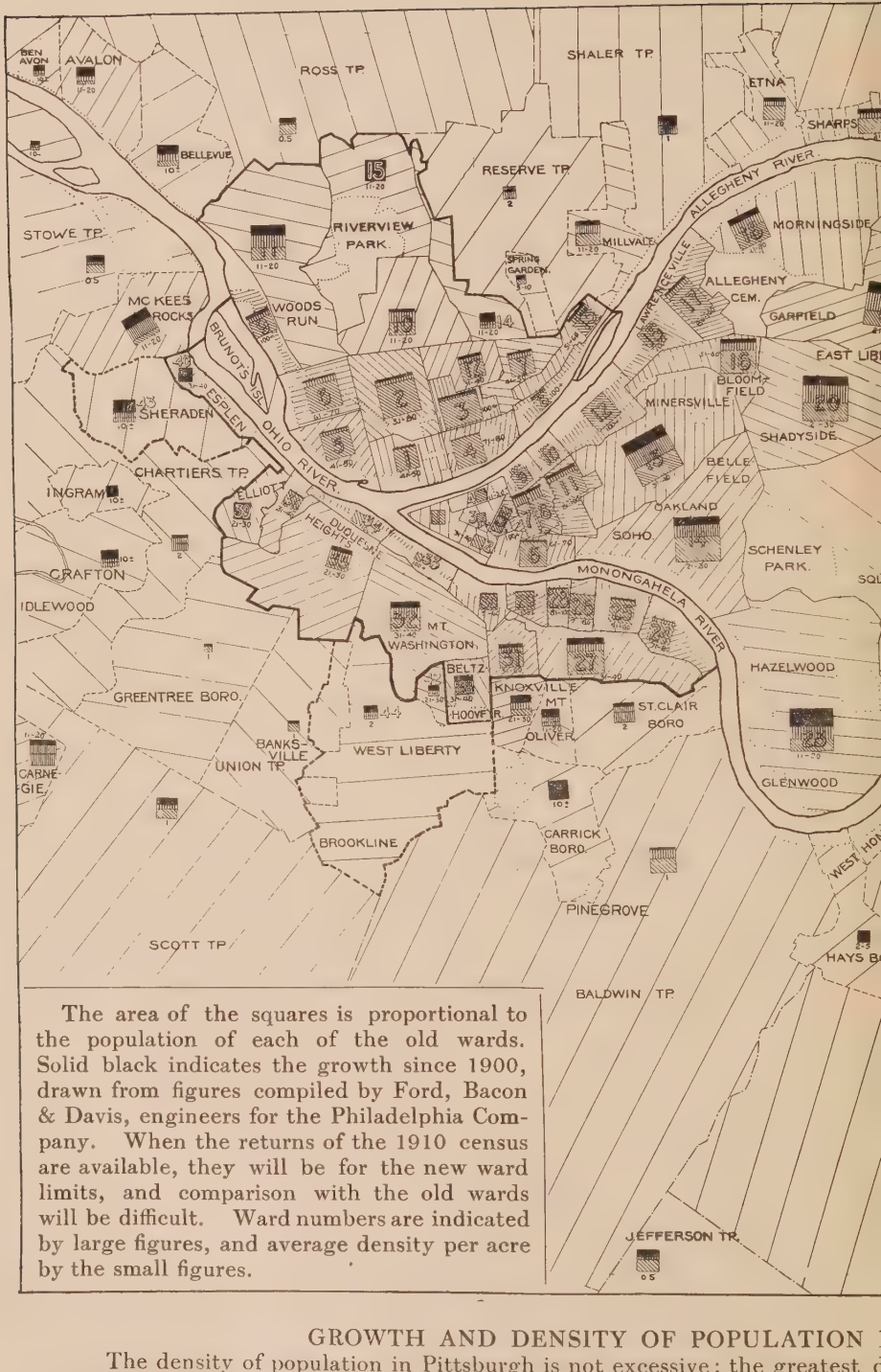
0 ½ 1 2 MILES

0 2000 4000 6000 8000 10000 FT

DISTRIBUTION OF POPULATION
BERLIN
ACCOMPANYING THE REPORT OF
BION J. ARNOLD
ON THE
PITTSBURGH TRACTION PROBLEM
TO HON. WILLIAM A. MAGEE
MAYOR OF PITTSBURGH

POPULATION IN BERLIN.

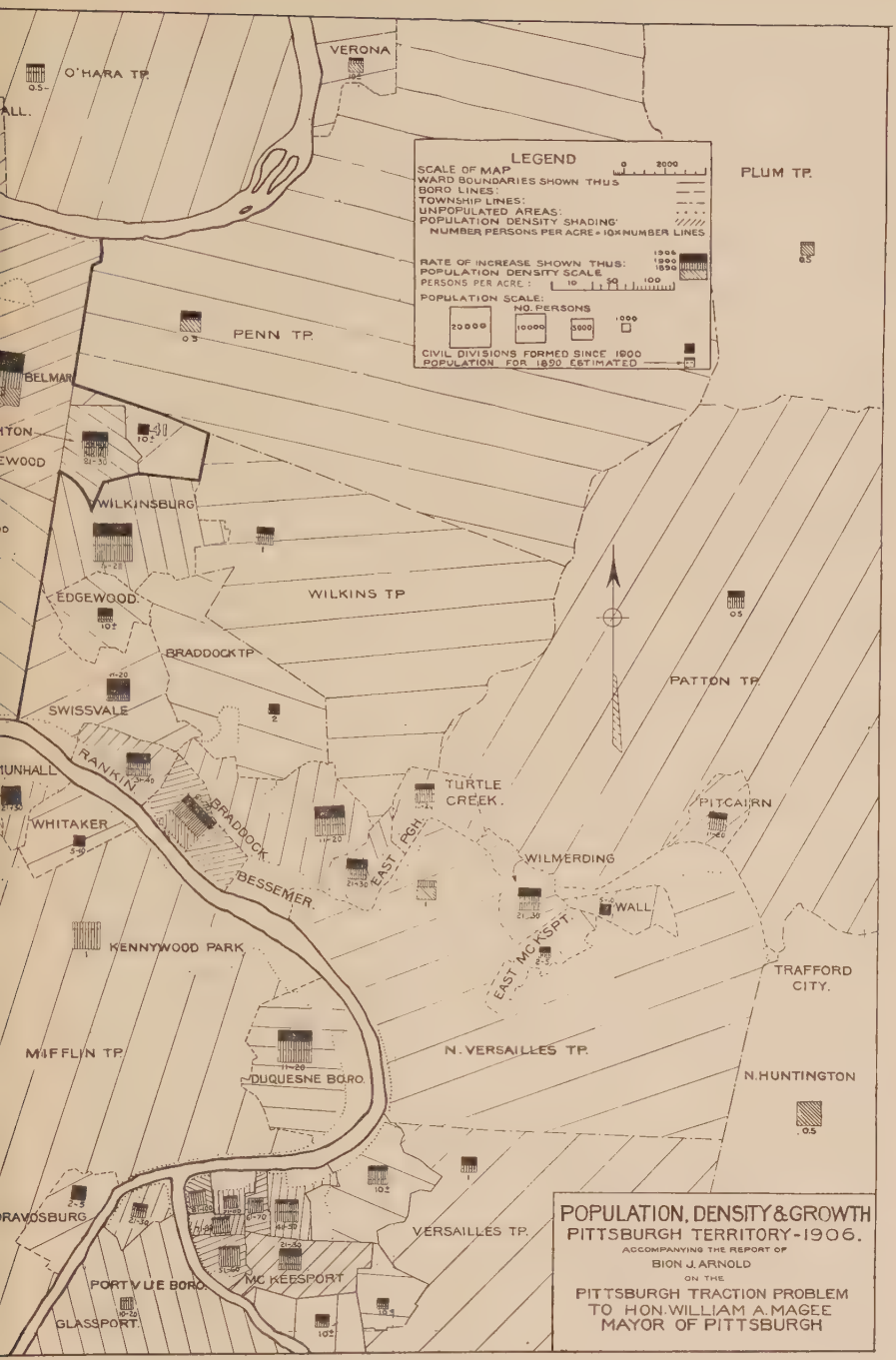
dot also representing 500 persons, illustrates how the European cities are verage density of population inside the city limits is only 21 persons per t capacity over the available routes. The surface, elevated and subway n'' steam roads handling considerable suburban and city traffic.



The area of the squares is proportional to the population of each of the old wards. Solid black indicates the growth since 1900, drawn from figures compiled by Ford, Bacon & Davis, engineers for the Philadelphia Company. When the returns of the 1910 census are available, they will be for the new ward limits, and comparison with the old wards will be difficult. Ward numbers are indicated by large figures, and average density per acre by the small figures.

GROWTH AND DENSITY OF POPULATION

The density of population in Pittsburgh is not excessive; the greatest d hardly exceed 100 per acre within the settled areas. In New York, the den evidently away from the centers, the maximum being in the outlying w



DIVISIONS—PITTSBURGH AND VICINITY.

92 per acre in the old 7th Ward, while most of the other congested wards lower East Side exceeds 1000 per acre. The tendency of growth is quite roughs. Down town wards are actually losing population.

points to serve the residents. During the time that the District depended for intercommunication upon the steam railroads, the relatively infrequent service caused each locality to be more or less isolated, depending upon itself for its own amusement and supplies, but with the introduction of the trolley system, the various communities were brought more closely together and the settlement of intervening territory began.

It was probably no philanthropic motive which prompted the promoters to build trolley lines to connect these outlying boroughs with each other and with the larger city, but the fact remains that very often the communities served by these pioneer lines have gained much more indirectly than they have contributed to the railroad in return. Bridges were built, grades reduced, highways opened up and streets were paved by the railroad system far in advance of the actual requirements of many localities, and the reward for some of this enterprise is still lacking.

What Transportation Still Has to Accomplish.

The advantage that many European cities have over our American cities is that they are "built up." Congestion of population is of course to be avoided, but on the other hand a certain density is to be desired. Up to a critical point (depending on the locality), the greater the population per acre, the higher the land values, the more costly are the improvements that are justified, the greater the income from taxes and thus better paving, sidewalks and sewers may be secured, and the utilities such as gas, water, electric light and transit may be supplied at a cheaper rate or in greater quantities.

The Pittsburgh District has already been very completely covered by its local transportation system, now the building up of the vacant spaces must take place. This can best be accomplished by limiting further advancement into outlying territory to *actual necessities* and by furnishing better service over the tracks already provided.

What is needed in the Pittsburgh District at the present time is a *"get together"* movement. The division lines between the different parts of the District must be more completely eliminated and the various centers must grow out to meet one another, and become massed into one community. In bringing about this desirable result, the lines of the local surface transportation system will play the most important part.

Difficulties That May be Turned Into Advantages.

It has often been pointed out that the rugged topography consisting of steep hills, deep ravines and only a few level spots, the narrow streets, the concentration of business into a section of 300 acres, the division of the city by its rivers into three parts, the isolated outlying communities and the lack of continuous street systems, are a unique combination of disadvantages which make it difficult to secure ideal or even good transportation. However it is very possible that a little study may turn many of these disadvantages into benefits. For instance, the fact that the city grew up without a definite plan resulted in many "cross cut" thoroughfares between the different centers. This is really an advantage over those cities having a right angle street plan without diagonal avenues. The development of the District, primarily by local communities, will be a distinct benefit to traction developments in the future, as the scattering of the shopping and amusement districts throughout a city means considerable short haul traffic, which will get on and off the through cars, thus utilizing them in the most profitable way. The more passengers that may be accommodated by each seat on a single one-way trip, the more efficient is the use of each car, and to secure this result, the more centers existing to attract riders, whether for business or pleasure, the better the service that may be given with the same equipment.

The fact that it is impracticable to run large cars up into the hills, where narrow and crooked streets with excessive grades exist, may be turned to good account toward securing better service by allowing this disadvantage to dictate the use of a transfer system, using the small hill climbers on through routes from one hill section to another, connecting by means of a convenient transfer station to the main line of larger cars, which will carry passengers through the business district to other transfer centers on opposite sides of the city. A similar transfer system has been worked out in Boston with notable success.

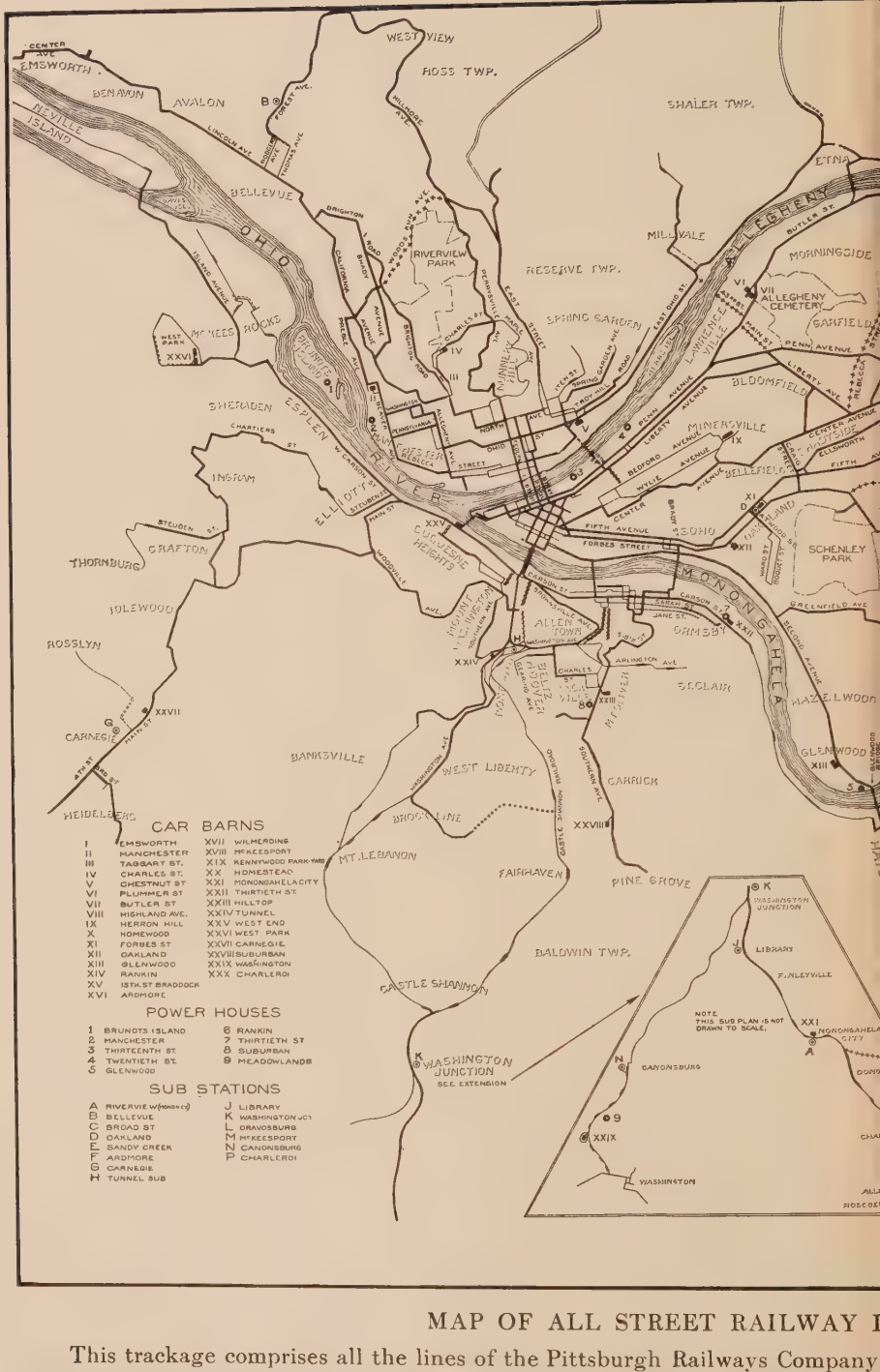
The entire situation, therefore, is by no means hopeless and does not demand radical changes in design or method of operation. A transportation system should really keep ahead of the development of the district which it serves, and fortunately the records of other cities show that increased business follows immediately after improved facilities.

One District, One System.

The most striking feature of the transportation developments in the Pittsburgh District is that its surface electric railway utilities have been combined into one system. Unification of operation is a result which may or may not be an advantage. At the present time there are some points of disadvantage, resulting largely from the fact that the *future* of the system was too heavily capitalized at the time the combinations were made

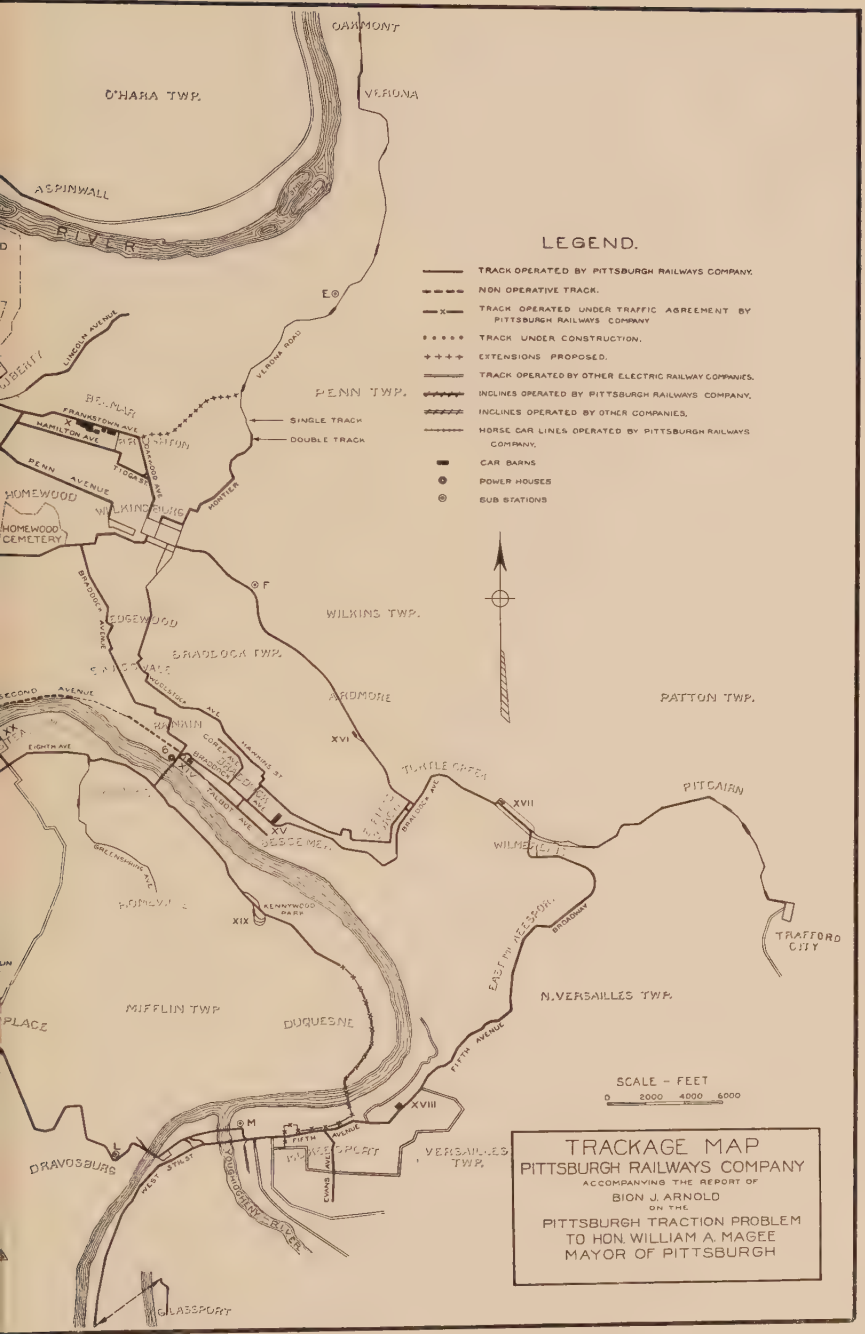
There can be little doubt as to the many benefits to be secured by the operation under one management of a large system such as is now controlled by the Pittsburgh Railways Company, but unless the public gets *some* of the advantages of the combination, there can accrue to the system itself no lasting benefits. The interests of the District and of the Company are so inseparable that eventually the sentiment must prevail that the benefits should be divided share and share alike.

Every effort should be put forth to conserve the progress that has been made toward a combined District served by a single trolley system, but this will be impossible if the company endeavors to collect toll too far in advance or if the citizens of the District fail to recognize that the building up of the system has required faith, enterprise and a large investment which in course of time should have its reward.



MAP OF ALL STREET RAILWAY I

This trackage comprises all the lines of the Pittsburgh Railways Company foreign companies operating in the District. Tracks radiate in all directions difficult topography. The Pittsburgh Railways system comprises 279.67 mil interurban track or a total of 581.00 miles.



N PITTSBURGH AND VICINITY.

erlying companies, whether owned, leased or operated, also those of the
e business center at the Point, the irregularity of the lines being due to the
track inside City limits. 241.67 miles in suburban districts. 59.66 miles

REVIEW OF SURFACE TRACTION DEVELOPMENT IN PITTSBURGH.

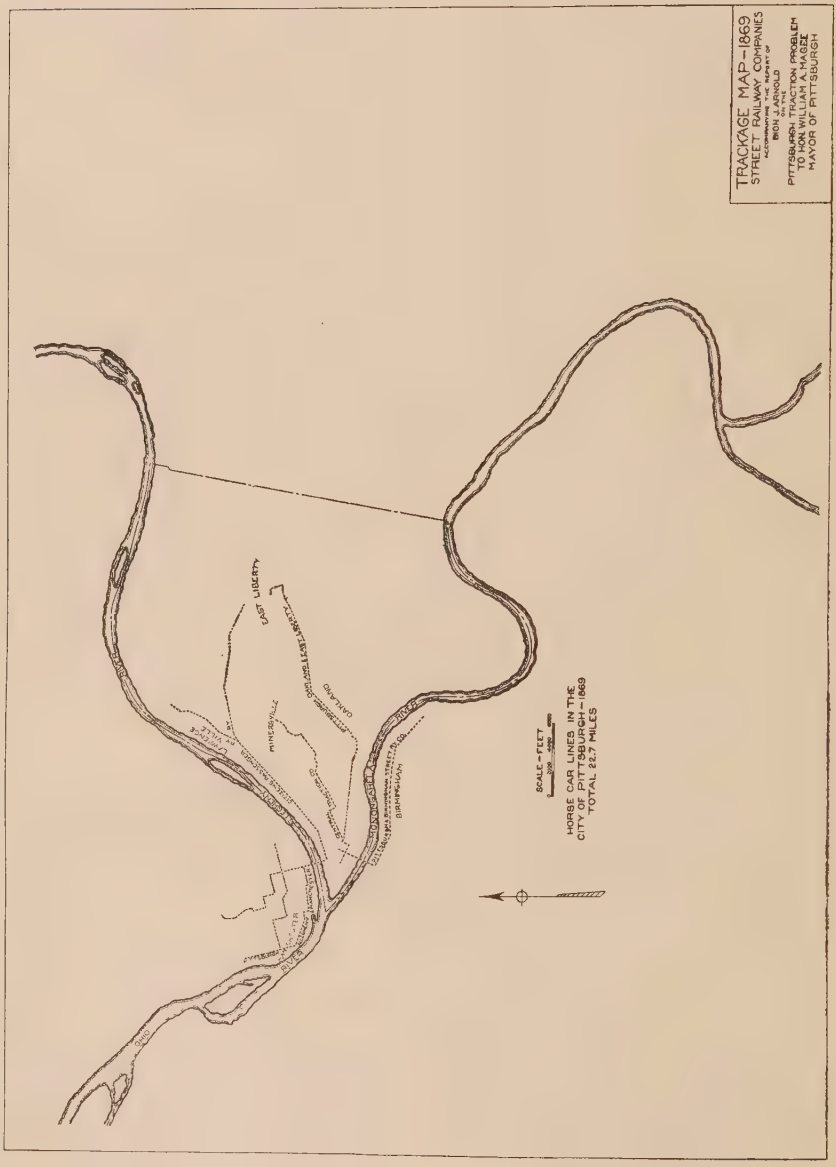
Noting the more important steps in the history of the formation of the present system—Horse car period, 1859 to 1887—Activity following enlargement of city boundaries in 1868—Experimental period, 1887 to 1891—Cable systems started in 1889—Pioneer electric road a failure—Other electric roads successful from the start—Abandonment of cable system in 1896—Period of exploitation and competition, 1891 to 1896—Traction business considered a "gold mine"—Destructive competition—Hard times of 1893-4 checks progress—Period of consolidation, 1896 to 1902—Gradual welding of roads into one system under Pittsburgh Railways Company—Outlook promising—Period of combined operation 1902 to 1910—Panics of 1903 and 1907 resulting disastrously—Corporate history—United Railways Investment Co.—Philadelphia Company—Pittsburgh Railways Company—Subsidiary Companies—Consolidated Traction Company—United Traction Company—Summary of Annual fixed charges—Taxation.

The developments which have resulted in the present system of street car transportation in Pittsburgh may be divided, for the purpose of analysis into the following periods:

Horse Car—Experimental—Exploitation and Competition—Consolidation—Combined Operation.

Horse Car Period—1859 to 1887.

The first street railway in Pittsburgh was a horse car line which began operations in 1859. The construction of the track consisted of strap tram rails spiked to longitudinal wooden stringers. This pioneer line carried passengers between the business district at the "Point" through the sparsely settled district known as "Bayards Town," along the Allegheny River to the "forks of the road" at Penn Avenue and Thirty-fourth Street, and thence through the village of Lawrenceville, which was then



HORSE CAR LINES IN PITTSBURGH AND VICINITY—1869

a high grade residence section, past the Allegheny Arsenal to the gate of the Allegheny Cemetery. Penn Avenue was at that time a toll road and a part of the "Philadelphia Pike."

One of the next lines to be built was from Fourth Avenue and Market Street along Fifth Avenue to Soho and thence to Oakland. Later this line was extended to East Liberty via Fifth Avenue.

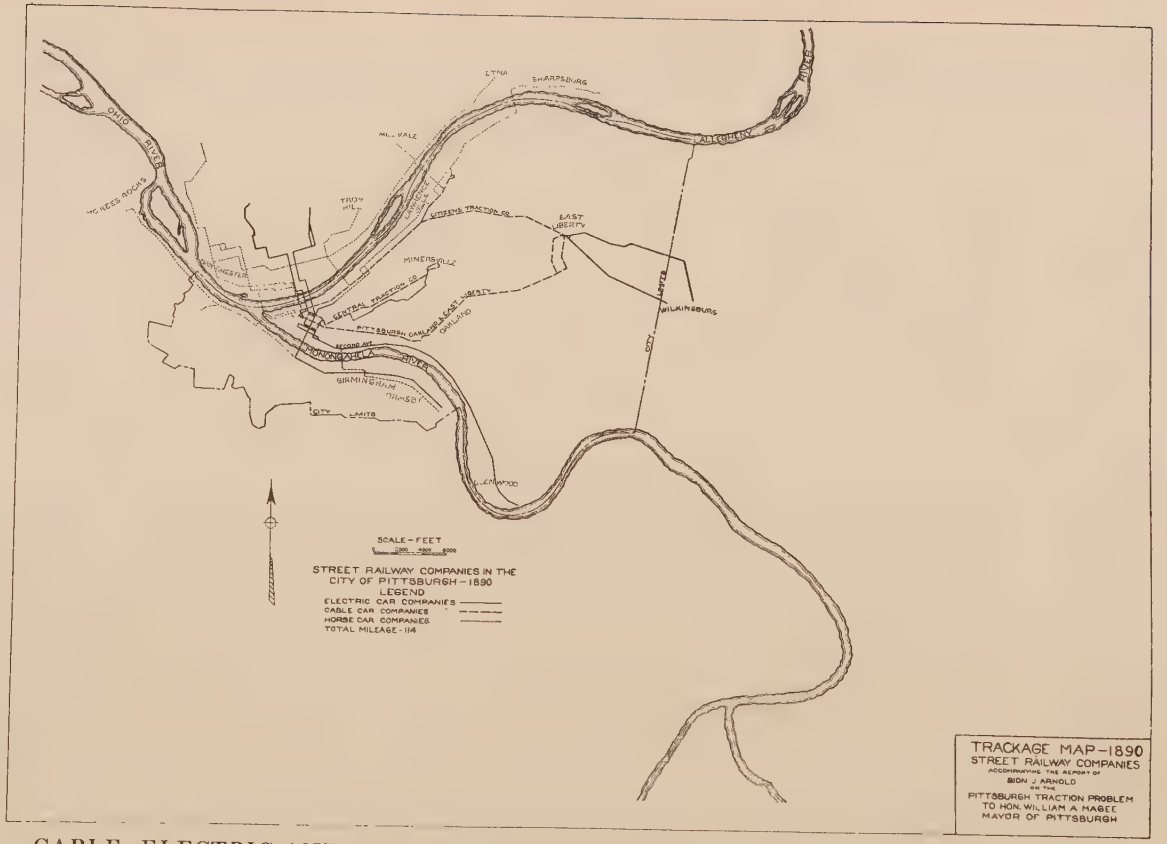
An epidemic of "pink eye" at one time crippled the supply of horses of this road so seriously that steam dummies were substituted, but the experiment with mechanical motors was not a success and horses were again used. These were the days of the "bobtail" car when straw on the floor was used in winter instead of a stove, and a fare box in lieu of a conductor. Turn-tables were used to reverse the cars at the ends of each line. On some of the cars the driver sat on top, as was the custom with the busses which the horse cars replaced.

Prior to 1874 a number of passenger railway companies were incorporated in Allegheny County, under special Acts of the Legislature. Of these companies the following are still in existence, and cars are being operated over routes granted in the original charters and supplements.

The Citizens Passenger Railway Company, incorporated in 1859, extended as a horse line out Penn Avenue from Sixth to Thirty-fourth Street. This line was subsequently extended out Butler Street, first to the Allegheny Cemetery and finally to Sharpsburg. The route was also extended from Thirty-fourth Street out Penn Avenue to East Liberty.

The Pittsburgh & East Liberty Passenger Railway Company, incorporated in 1859, extended as a horse line out Fifth Avenue to Oakland. This company was reorganized twice—first as the Oakland Railway Company and then as the Pittsburgh, Oakland & East Liberty Passenger Railway Company. Its route was finally extended out Fifth and Penn Avenues to Wilkinsburg, and from Fifth Avenue to East Liberty via Shady and Highland Avenues.

The Pittsburgh & Birmingham Passenger Railroad Company, also incorporated in 1859, extended from the corner of Fifth Avenue and Smithfield Street, along Smithfield, across the Smithfield Street Bridge to Carson Street, and thence along Carson to about South Twenty-fourth Street. This line was subsequently extended eastward to the Union Depot in Pittsburgh and to the present city line on the South Side.



CABLE, ELECTRIC AND HORSE CAR LINES IN PITTSBURGH AND VICINITY—1890.

The Pittsburgh, Allegheny & Manchester Passenger Railway Company, was also one of the original horse car lines incorporated in 1859, and extended from the corner of Penn Avenue and Sixth Street in Pittsburgh, along Sixth across the Sixth Street Bridge, thence along Federal Street, Allegheny, and thence to the Borough of Manchester. Various extensions were subsequently built to this route.

The Federal Street & Pleasant Valley Passenger Railway Company was incorporated in 1868 and built a line extending from the corner of Fifth Avenue and Smithfield Street, on Smithfield Street to Seventh Avenue, thence across Liberty Street to Ninth Street across Ninth Street Bridge, thence along Anderson Street, Allegheny, to Church Avenue, to Union Avenue, to Gay Alley, to the east side of the Diamond, Federal Street, to North Avenue and thence to the Hilldale Cemetery. This Company, by various consolidations and extensions later acquired practically all the routes operated on the north side of the river, except those of the Pittsburgh, Allegheny & Manchester Passenger Railway Company, referred to above.

The Central Passenger Railway Company was incorporated in 1869. This line originally extended out Wylie and Center Avenues to Minersville. The Pittsburgh & East Liberty Passenger Railway Company, mentioned above, had the right under its charter to construct a branch over this route. This franchise passed successively to the Oakland Railway Company, the Pittsburgh & Minersville Passenger Railway Company, and finally to the Central Passenger Railway Company. Various extensions have been constructed from time to time.

The Pittsburgh & Ormsby Passenger Railway Company obtained rights in 1870 to build out Second Avenue, Pittsburgh, to Tenth Street Bridge, thence across the bridge to Washington Street, to South 17th Street, to Sarah Street, and thence along Sarah Street. Subsequently the stock of this company was acquired by The Pittsburgh & Birmingham Passenger Railroad Company, and the Pittsburgh Railways Company now operates this route as part of its system.

Experimental Period—1887 to 1891.

In 1887 Messrs. Widener and Elkins of Philadelphia acquired a controlling interest in the horse car line running to East Liberty through Oakland, and laid plans to substitute mechanical power by means of the under-running cable system. This system had just been installed on the steep grades of San Francisco, and apparently promised much for rapid transit under similar situations in Pittsburgh.

Simultaneously, one of the first electric roads in the country was being installed from the intersection of Carson and Thirteenth streets on the South Side up the steep grades to Knoxville Borough. This line was backed by citizens of Knoxville and Mt. Oliver in the hope of improving transportation in that district, which at that time depended mostly upon the inclines. At this time there was a considerable doubt in the minds of railway engineers as to the relative advantages of cable and of electric traction for street car purposes, and the experiment in Pittsburgh was a decided contribution to the art.

The first cable line, extending from Fifth Avenue and Liberty Street to Shady Avenue, East End, was opened for business September 12th, 1889, and at once cut the time of travel for its five miles of length from one and three quarter hours to thirty minutes. The second cable line replaced the horses of the pioneer Citizens Company on Penn Avenue, and began operations in January, 1890, while the third and last cable road out Wylie Avenue to Minersville was put into service in February, 1890.

In the meantime the "Daft" system of electric traction had been installed to climb the south hills to Knoxville. This line was built before the introduction of the present form of trolley pole and wheel, the contact with the wire overhead being made by means of a small carriage trailing behind the car and running on top of two trolley wires. On account of the steep hills, rack and wheel propulsion was used, but the line did not prove to be a great success.

The next attempt at electric traction was made in 1889 on Observatory Hill in Allegheny and was more promising. On July 2nd, 1889, the Observatory Hill Passenger Railway was purchased by Messrs. Graham and Henry, who at once proceeded to electrify it and the Pleasant Valley road in Allegheny which they also owned. Mr. Henry had visited Richmond, Virginia, where an electric line had already been built by Mr. Frank J. Sprague, and at once completed arrangements for a similar installation on his Allegheny roads. The Pleasant Valley line had the distinction of being the first electric line to enter the business district of Pittsburgh. Its route crossed the Ninth Street bridge, which was then a wooden structure. It appears to have been the first electric line to use the now common "cast weld" joint. Moreover, for a short distance in Allegheny—from the City Hall to the end of Federal Street—it operated for a time with underground conduit system, similar to that now in use in New York and Washington.

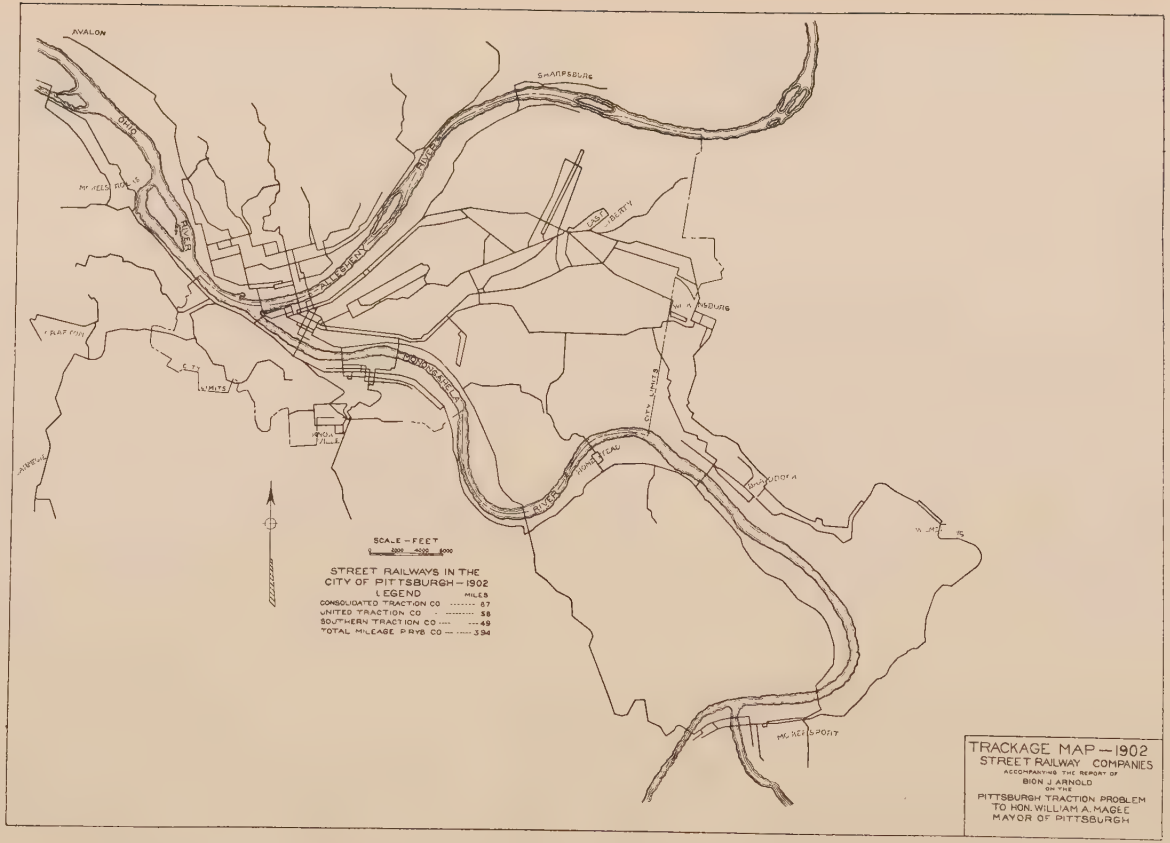
The success of these pioneer electric lines led to the building of the Second Avenue line, from the junction of Market Street and Fourth Avenue to Glenwood, which began operating electric cars in March, 1890. In this enterprise Mr. James D. Callery, now President of the Pittsburgh Railways Company, was the active head. Successful from the start, the line was later extended into Homestead, Braddock, McKeesport, Wilmerding, East Pittsburgh and other Monongahela river towns.

The electric system thus gradually demonstrated that it was better adapted than the cable to furnish rapid transit over the hills of the Pittsburgh District. Plans and contracts which had been made for a cable road to Birmingham were abandoned, and electricity was substituted. Eventually the electric trolley supplanted the cable on all the lines where it had been installed, and by 1896 all cable operations in Pittsburgh had been abandoned. Remains of the conduit and slot may still be seen on certain streets as upper Wylie Avenue, as reminders of the millions invested in the expensive cable system, only to be abandoned about six years after it was first installed.

Period of Exploitation and Competition— 1891 to 1896.

The introduction of the more rapid transportation by means of the cable and the electric car greatly increased the "riding habit" of the people. The earnings per capita showed a very gratifying upward tendency, and the street railway business appeared like a "gold mine." Lines were projected in all directions, rights of way were secured, franchises were obtained and *parallel lines* were built, usually competing with those already established. The total length of track increased from 89 miles in 1891 to 337 miles in 1896, a rate of growth of about fifty miles per year, which is nearly three times the yearly rate of growth since that period.

But unfortunately in 1893-4 came the hard times which had a very depressing effect on the expected earnings. Competition was keen, resulting inevitably in disastrous rate-cutting. During this time the Fifth Avenue line was paralleled by a line on Forbes Street. Where the fare had previously been six cents up to the City line and one cent per mile beyond, competition now forced the fare down to four cents, resulting in losses to both companies. At the same time another line was built out Liberty Avenue and equipped with electricity to compete with the Penn Avenue cable line.



ELECTRIC CAR LINES IN PITTSBURGH AND VICINITY CONSOLIDATED UNDER THE MANAGEMENT OF THE PITTSBURGH RAILWAYS COMPANY—1902.

Period of Consolidation—1896-1902.

The loss of business during the panic and the recognition of the inefficiency of competitive systems, with separate managements, but occupying the same field, brought about a gradual consolidation.

The Consolidated Traction Company was chartered on July 24th, 1895, and by lease, purchase of stock or assumption of prior obligations, the company secured the control of 187 miles of trackage.

The *United Traction Company* was chartered on July 27th, 1896, and in a similar way built up a separate operating system of 157 miles of trackage.

The Philadelphia Company entered the street railway field in October, 1899, by securing the stock of the United Traction Company. Since that time it has absorbed the Consolidated Traction Company and nearly all of the other street railway properties in the Pittsburgh District.

The Southern Traction Company was chartered in 1900 to consolidate the lines of the West End Traction Company, and under this name acquired a system of 48.8 miles of track.

The Pittsburgh Railways Company was the name adopted by the Southern Traction Company on December 30th, 1901, and on January 1st, 1902, the Pittsburgh Railways Company assumed control as an operating company of all the street railway properties owned and controlled by the Philadelphia Company with the single exception of the Beaver Valley Traction Company. At this time the entire system embraced 400.16 miles of single track, and the earnings were $6,758,000 per year.

For several years prior to the combining of all the underlying companies, the earnings had been increasing each year at an unprecedented rate and the future of the united system was unquestionably promising.

Period of Combined Operation—1902-1910.

For the first two years after the formation of the combined system, the results were all that could be expected. The service was not bad, and the net earnings were sufficient to pay the guaranteed rentals and the fixed charges for interest on the funded debt. Then came the panic of 1903-4. Earnings fell off, but expenses and fixed charges did not decrease in proportion, and the result was a deficit.

This process was repeated during the panic commencing October, 1907. In the meantime extensions had been made at the rate of about 20 miles of track per year. The result has been that, in an attempt to save for fixed charges as much as possible of the gross earnings, the service has been starved, maintenance has been neglected and renewals have not taken place as regularly as the rolling stock and other parts of the equipment became obsolete.

As a further result of the strenuous objections to over-crowding of cars made by the city authorities, a betterment of the service has been brought about but with a corresponding *accumulating increase in the deficit* at the close of each of the last three years.

CORPORATE HISTORY OF ORGANIZATION.

This report is not intended to cover the history in detail of the many changes in ownership and operation of the 150 companies which have become a part of the present system, but the results of this combination of interests may be briefly recapitulated as follows:

The United Railways Investment Company was incorporated under the laws of the State of New Jersey, on February 17, 1902. It is a "holding company" formed for the purpose of dealing in the stocks and bonds of other corporations. It owns all the common and all the preferred stock of the United Railroads of San Francisco, and in 1908 purchased the Stanislaus Electric Power Company of California. In 1906 this company acquired $24,200,000 or 72.8 per cent of the outstanding common capital stock of the Philadelphia Company of Pittsburgh.

The Philadelphia Company, which is not an operating company, conducts the street railway business in the cities of Greater Pittsburgh and McKeesport, and the territory adjacent thereto, through the medium of the Pittsburgh Railways Company, whose stock both common and preferred, is owned by the Philadelphia Company, while that in the vicinity of Beaver Falls is conducted through the medium of the Beaver Valley Traction Company, which the Philadelphia Company owns. The Washington & Canonsburg Company was made a part of the Pittsburgh Railways Company on January 1st, 1909.

The Pittsburgh Railways Company, was incorporated by Special Act of Assembly, approved May 25th, 1871, as a

"Surety Contract Company." On June 15th, 1892, all its property, rights and franchises were sold by the Sheriff of Philadelphia County, and the purchasers reorganized in accordance with the Act of 1873. Letters Patent were issued October 16, 1894. On December 31st, 1901, the name of *Pittsburgh Railways Company* was adopted. It is one of the seven or eight corporations chartered by the Legislature of 1870-71 which are known by the generic name of "Pennsylvania Companies," all of which have very broad and comprehensive powers.

Companies subsidiary to Pittsburgh Railways Company. All of the subsidiary companies were incorporated under the General Act of March 22nd, 1887, and most of them were reincorporated under the General Act of May 14, 1889. This subsequent Act provides that companies may be incorporated under its provisions for the purpose of constructing, maintaining and operating street railways for public use in the conveyance of passengers by any power, other than locomotive, on any street or highway now laid out, or to be laid out, upon which no track is laid or authorized to be laid under any existing charter.

The incorporators of the company are required to make and sign Articles of Association in which shall be stated the name of the Company, the number of years the Company is to continue, the length of the road, the streets, highways and bridges upon which the road is to be constructed.

It is said that the Act confers upon a company incorporated under its provisions an exclusive franchise to construct and operate a street railway upon the route named in its Articles of Association, and that in effect, it confers *perpetual* as well as *exclusive* franchises, for the reason that companies may be incorporated with a perpetual duration to their corporate life. It is claimed that the street railway companies subsidiary to the Pittsburgh Railways Company, with few exceptions, have been incorporated for a perpetual duration, or for a period of time extending beyond 900 years, so that all their franchises, with these exceptions are practically perpetual in their duration.

The Pittsburgh Railways Company now operates as one system all of the lines formerly operated by the various traction companies. It also operates under agreements, the following named companies, whose stock is all owned by the Philadelphia Company.

Seventeenth Street Incline Plane Company.
Pittsburgh Southern Street Railway Company.
Tustin Street Railway Company.
Rosslyn Street Railway Company.

No rentals are paid to the companies *owned* by the Philadelphia Company, and the Pittsburgh Railways Company receives the earnings of the companies owned *by it*. Therefore, with the exception of the rentals paid on account of the Consolidated and the United Traction systems, the Pittsburgh Railways Company pays rentals only to the Pittsburgh & Castle Shannon Railroad Company.

Under leases and operating contracts, the Pittsburgh Railways Company guarantees the payment of interest on a number of underlying mortgages upon property not belonging to the Consolidated or the United Traction Company systems.

The Pittsburgh Railways Company operates the Consolidated and the United Traction Companies under contracts which may be terminated at any time on three months' notice by either party. These contracts obligate the Pittsburgh Railways Company to pay dividends upon the preferred and common stock of the Consolidated Traction Company at the respective rates of 6% and 2% and upon the preferred and common stock of the United Traction Company at the respective rates of 5% and 1%. The Philadelphia Company receives all these dividends with the exception of a small amount which goes to outsiders. These contracts also obligate the Pittsburgh Railways Company to pay, in addition to all expenses of operation, ordinary maintenance and taxes, State, County and Municipal, all interest and rentals which the Consolidated and the United Traction companies are obligated to pay on account of the companies formerly operated by them.

The Consolidated Traction Company formerly operated under lease or through stock ownership some thirty-five companies. On stock not owned by itself or its leased or owned subsidiary companies it is required to pay *rentals* on the property of about nine companies, the stock of which is owned largely by outsiders. It guarantees the payment of *principal and interest* on bonds secured by about eleven mortgages through its leases or through the leases of the Fort Pitt Traction Company, of which it is the owner. It guarantees payment, through its leases, of *interest—but not principal*—on the bonds secured by five mortgages.

The United Traction Company formerly operated about thirty-two companies under lease through stock ownership. On stock not owned by it or its leased or owned companies, it is required to pay rentals on the property of about nine companies, the stock of which is owned largley by outsiders. It guarantees

the payment of the *principal and interest* on bonds secured by about fifteen mortgages, and it guarantees the payment of the *interest, but not the principal* on the bonds secured by about twelve mortgages.

Summary of Annual Fixed Charges.

The various obligations which are fixed by agreements may be classified as follows:

Rentals of Leased Property.

Stock owned by the Philadelphia Company on which dividends in the form of rentals are guaranteed.

Stock owned by outsiders on which dividends in the form of rentals are guaranteed.

Rental of Pittsburgh & Castle Shannon Railroad Company.

These obligations aggregated $2,278,869.21 for the fiscal year ending March 31st, 1910.

Interest on Funded Debt.

Outstanding bonds and mortgages on which interest is guaranteed of the Pittsburgh Railways Company, the Consolidated Traction Company, and of the United Traction Company or of their respective subsidiaries.

These obligations amounted to $1,869,989.90 for the fiscal year ending March 31, 1910.

Miscellaneous Interest and Discount.

This item has been growing from $61,749.24 in 1903 to $435,765.95 in 1910.

Car Trust Debentures.

There is an item of $40,000 per year for the retirement of a series of equipment notes. This item is now charged to Extraordinary Maintenance Expense.

State Taxes.

Five mills on each dollar of the actual value of entire capital stock.

Four mills on each dollar of interest paid to residents of the state.

Eight mills on each dollar of gross receipts.

City Taxes.

North Side Traction Company is required to pay the city of Allegheny an annual tax of 2% on its gross earnings.

A similar tax upon Cedar Avenue Street Railway
Howard & East Street Railway,
Lacock Street Railway Company
Superior Ave. & Shady Ave. St. Ry. Co.

Other companies in Allegheny are subject to a car tax of $40.00 per car per year.

Car tax in the City of Pittsburgh—for all lines entirely in in the City—$60.00 per year per car. This tax was subsequently raised by ordinance of 1906 to $100 per car. But when contested by the railway company, was held to be illegal. Now the City's right to collect under the original ordinance is still in dispute.

Cars on lines not entirely within the city—$30.00

Borough taxes.

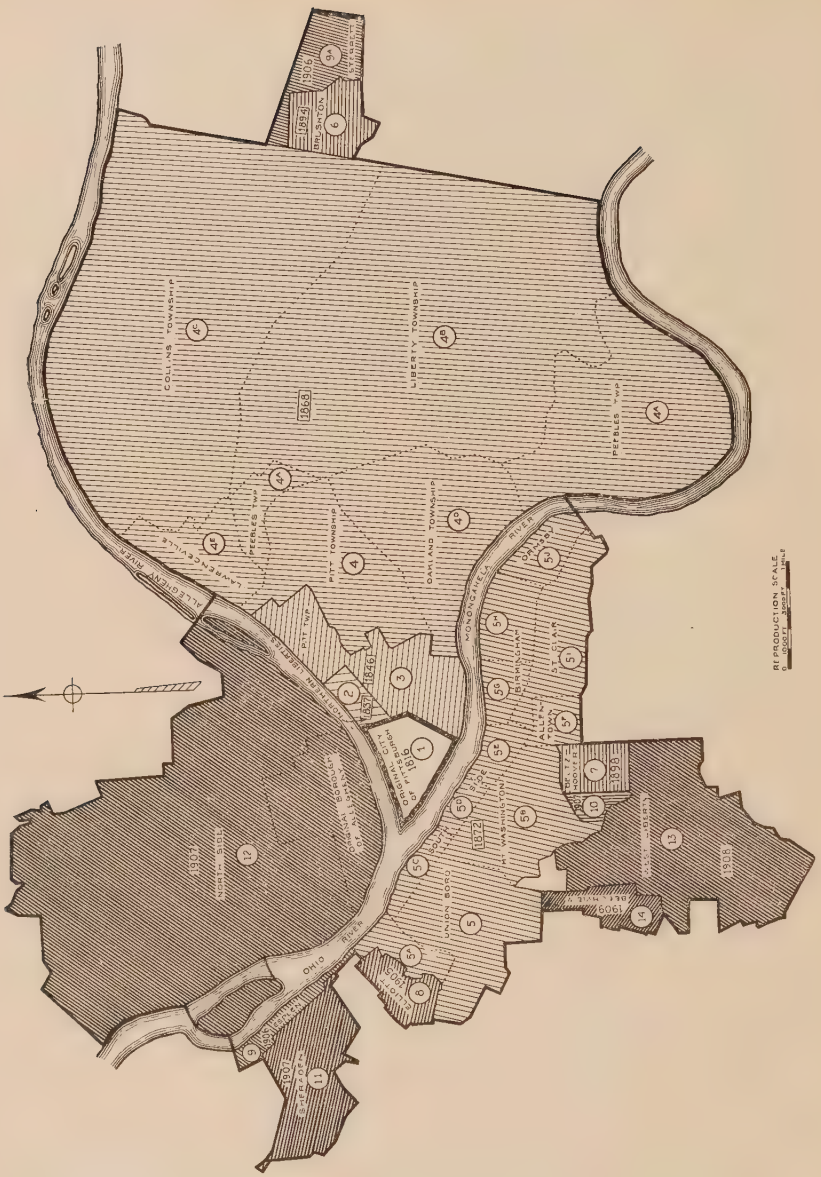
Various taxes are assessed by the individual boroughs such as general taxes, pole taxes, wire taxes and car taxes.

TERRITORIAL GROWTH OF PITTSBURGH BY ANNEXATION.

Key No. on Map	Territory Annexed	Date of Entry	Annexed Area Acres	Annexed Area Sq.Mi.	Total Area Acres	Total Area Sq.Mi.
1.	Borough of Pittsburgh	March 5, 1804	320	0.50	320	0.50
	City of Pittsburgh	March 18, 1816				
2.	Northern Liberties Boro.	March 1, 1837	110	0.18	430	0.68
3.	Parts of Pitt Township	Dec. 15, 1846	700	1.09	1130	1.77
4.	Remainder of Pitt Twp	June 30, 1868	13568	21.34	14788	23.11
4-A	Peebles Township					
4-B	Liberty Township					
4-C	Collins Township					
4-D	Oakland Township					
4-E	Lawrenceville Boro.					
5.	Union Borough	April 2, 1872	2684	4.20	17472	27.31
5-A	Temperanceville Boro.					
5-B	Mt. Washington Boro.					
5-C	West Pittsburgh Boro.					
5-D	Monongahela Boro.					
5-E	South Pittsburgh Boro.					
5-F	Allentown Borough					
5-G	Birmingham Borough					
5-H	East Birmingham Boro					
5-I	St. Clair Borough					
5-J	Ormsby Borough					
6.	Brushton Borough	Dec. 1, 1894	290	0.45	17762	27.76
7.	Beltzhoover Borough	Mar. 1, 1898	190	0.30	17952	28.06
8.	Elliott Borough	Jan. 2, 1905	203	0.32	18155	28.38
9.	Esplen Borough	Jan. 8, 1906	180	0.28	18335	28.66
9-A	Sterrett Township	Jan. 8, 1906	310	0.49	18645	29.15
10.	Montooth Borough	Jan. 7, 1907	73	0.11	18718	29.26
11.	Sheraden Borough	Nov. 21, 1907	621	0.97	19339	30.23
12.	City of Allegheny	Dec. 6, 1907	5165	8.07	24504	38.30
13.	West Liberty Borough	Jan. 6, 1908	1751	2.72	26255	41.02
14.	Beechview Borough	Jan. 4, 1909	210	0.33	26465	41.35

Pittsburgh is often referred to as a peninsular city, but its recent growth into "Greater Pittsburgh" has brought about a change from a one sided city like San Francisco to one with a centrally located business district. Originally expanding to the eastward from the Point, it later took in many of the boroughs to the south, and recently the City of Allegheny. Efforts were made as early as 1853 to annex Allegheny, but without success.

All dates of annexation are given in the plan and in the accompanying table together with the area of each annexation.


COLLINS TOWNSHIP
LIBERTY TOWNSHIP
PEEBLES TWP
PEEBLES TWP
PITT TOWNSHIP
OAKLAND TOWNSHIP
LAWRENCEVILLE
ALLEGHENY RIVER
MONONGAHELA RIVER
OHIO RIVER
1868
1837
1846
1872
1868
1867
1905
1908
1907
1901
1908
1907
1868
1868
1868

PITTSBURGH'S IMMEDIATE TRANSIT NEEDS.

Discussing causes and effects of present traction conditions and remedies therefor—Definite policy needed most—Public opinion growing more enlightened—Development of combined system—Present defects due to overcapitalization and expansion, loss of business and inconsistent routing—City attempting to regain control by legislation—Progress of State legislation toward regulation—Traction reports on Pittsburgh Problem—Recommendations of State Railroad Commission—Conferences between City and Company—Causes of inactivity—Necessity and basis for permanent settlement—A suggested program.

Stated in the briefest possible terms, the *immediate need* for transportation in Pittsburgh is

Something Definite for the Present Uncertainty.

The present system needs *more cars* and *better tracks.* The Company evidently needs more money for *rehabilitation* and additional capital for *improvements,* and there should be some kind of a working agreement between the City and the Company in regard to *service, re-routing* and *new connections.* But where there should be confidence, certainty, co-operation and progress we find instead suspicion, doubt, controversy and delay.

At the present time, the situation is, to say the least, *uncertain*—both from the City's and from the Company's standpoint. In seeking a remedy for the present *unsatisfactory condition of service,* for the evident hesitancy on the part of the company to *maintain and improve its property,* and for the *lack of public control* of transit facilities, it will be desirable to sketch briefly the combination of circumstances which have contributed to the present uncertain situation.

Development of Public Opinion.

It is instructive to note first the development of the attitude of the public toward the public utility corporations supplying transportation to the District.

The first charters and franchises, dating from 1859 to 1874 were issued cautiously and, as a rule, required that companies

keep the streets (upon which their tracks were laid) *clean and in perpetual good repair from curb to curb,* and to pay a *tax upon* their *earnings* as well as a graduated *car tax,* amounting after five years to $40.00 per car per year. A number of these first franchises reserved to the City *the right to purchase the road* after the expiration of twenty years.

From 1874 to 1887, there was a noticeable falling off in the conditions imposed upon new street passenger railway companies although in most ordinances passed during this period the companies were required to keep the streets in repair between their tracks and in some cases they were also required to pay a car tax to the City.

Beginning about 1887, however, the city's gates were literally let down and franchises were granted with practically no restrictions. The demands of the community for transportation were pressing and those in control of the city government granted franchises practically without time limit or other conditions. The older companies, taking advantage of the city's more liberal policy toward traction enterprises, ceased to comply with the requirements of their charters and franchises, and so it may be said that during the period from 1887 to 1902 the City practically surrendered to the Railway Companies its rights to its own streets.

The constitution of Pennsylvania requires all street railway companies to procure the consent of the municipality before constructing their roads, and the courts have held that the municipality may impose any conditions it pleases to the granting of this consent. Therefore, the City, in its grants, *had it seen fit to do so,* could have fixed fares, could have provided transfers, could have regulated the number of passengers to be carried on each car and could have provided for compensation, and in other ways could have retained *the power of regulation* so as to have insured adequate service. But through the eagerness of the citizens to secure electric trolley lines to all parts of the city and the ability of the promoters to secure valuable franchises, these fundamental rights were not insisted upon, and although there are a few minor protests on record, it is safe to conclude that the general consensus of public opinion between 1887 and 1902 was in favor of securing the benefits of the trolley, particularly for the outlying districts with the minimum amount of regulation or delay.

The period from 1887 to 1902 was also an era of consolidation with its attendant rapid increase in capitalization, but as

there were great benefits to be expected from the amalgamation of the many separate companies into one system there were no difficulties placed in the way of this series of combinations, either by legislative acts, city ordinances or court proceedings. At no time in the history of the combination has there been any consistent effort made on the part of the people to limit capitalization or to inquire into the terms of the many leases, trackage rights rentals or guaranteed dividend agreements, which are part of the present corporate structure of the railway system.

Apparently at no time has there been an effort to make the City's consent a necessary part of the transfer of franchises, a provision which would have made speculation in franchises a much more difficult matter, nor has there been a consistent effort to maintain the right of the City to purchase the property at a fair valuation—a provision which would have tended to keep down the capitalization to somewhere near the real investment.

Now that enlightened public opinion is beginning to understand the necessity of complete public control, it seems strange that the power of regulation should have been so lightly considered at the time of granting the franchises.

Development of Present Combined System.

As has been pointed out in more detail in other parts of this report, the present system, operated by the Pittsburgh Railways Company, is the result of a combination of about 150 underlying transit companies. Many of these lines were originally horse car lines, and some passed through the experience of being rebuilt first as cable lines and then as electric trolley lines. The original electric equipment often proved to be inadequate and has been or is being replaced from time to time. The cost, of all these changes, as a rule, have been capitalized.

The introduction of the electric trolley marked the extension of the lines into outlying districts at a very rapid rate, and the rugged topography of the District made these extensions comparatively expensive, particularly as the costs of street improvement by the railway company was often made a condition of the grants in outlying boroughs.

Following the tendency of all systems of this kind toward a combination and monopoly control of the transit situation, the original companies were combined into three separate systems. This was done by means of purchase of stock, by leases for long periods, by operating agreements and by guaranteed dividends. In 1902 these three companies were brought under

the control of the Philadelphia Company, and the operation of the combined system turned over to the Pittsburgh Railways Company. In 1906, at about the same time, the control of the Philadelphia Company passed into the hands of the United Railways Investment Company.

Development of Present Defects.

There is no one thing that can be said to be the chief cause of the present troubles. The weakness seems to be inherent to the method of organization rather than the result of any superficial defects which can be easily remedied.

Non-Paying Extensions. In an effort to cover the territory and keep out competition, or possibly, as has often happened in other cities, to enhance the value of real estate in certain localities, a number of lines have been built in advance of an actual demand sufficient to justify them, and these pioneer lines must be carried for a period of time until the District develops. *The whole system may be said to be over expanded.*

Overcapitalization. In order to bring about a consolidation of the many separate subsidary companies into one system, rentals were agreed upon in a form of a guaranteed dividend on stock which was often part "water." Companies have been absorbed with considerable profit to their former owners, and in raising money on bonds, rates of interest have been high and discounts liberal. Although the present property consists of 581 miles of single track, a new system consisting of about 550 miles could probably be produced which would render equally as good or better service at a cost of about $100,000 per mile or $55,000,000, which is about half the capitalization of the present system.

As a general rule the actual *investment* in a surface system should not exceed $5.00 for each dollar of probable annual earnings. Pittsburgh's earnings are now approaching $20,000 per mile of single track actually operated, and the investment should therefore be limited to an average of about $100,000 per mile until the earnings increase.

The actual *capitalization* of the system is not important as there are some of the securities upon which dividends have never been paid. But the amount of "fixed charges," consisting of

interest and guaranteed dividends, is the figure which should be studied. For the last fiscal year (ending March 31, 1910), these fixed charges were as follows:

Rentals of leased property	$2,278,869.21
Interest on Funded Debt of Pittsburgh Railways Company and leased Companies	1,869,989.90
Miscellaneous Interest and Discount	435,756.85
Total "fixed charges"	$4,584,615.96

On a basis of 5% return, these fixed charges would justify a capitalization of about $92,000,000, but the net earnings after deducting operating expenses and extraordinary repairs were not sufficient to pay all of the fixed charges. The "deficit" for the year amounted to $1,321,453.13—bringing the amount for fixed charges actually earned down to $3,263,162.83. This figure, capitalized at 5%, would amount to $65,263,000; or if capitalized at 6% instead of 5%, then the capitalization of the Company as determined by its earning capacity would be $54,200,000, which is about the figure that would produce a new property equally as good as the present property for serving the District. It must be understood of course that the *present value* of the property is not as great as the *reproduction value new* of the *present property*, but it should also be understood that the rate of return on the investment, whatever may be considered fair, should be figured on the *present value* of the property *plus the cost to rehabilitate and improve it* so as to put in first class up-to-date condition. This conception of a "fair return" on the investment presupposes an obligation on the part of the Company to take care of depreciation out of earnings as it occurs.

It will thus be seen that as the railway system was operated last year, the actual net earnings cannot be said to be excessive, although the question naturally arises—how is the deficit of over a million dollars to be financed and what provision is to be made for past, present and future depreciation?

Depreciation Account. During the *eight years* the present company has been in control, only about *one million dollars of its earnings have been put back into the property* to take care of *renewals*, whereas the deterioration of the property due to causes other than ordinary wear and tear has been going on at the rate of at least a million dollars *per year*. While several million dollars have been expended by the Company for renewals during this period, this money, which should have been taken from earnings, was not available owing to the

high fixed charges which were agreed upon at the time of the consolidation of the various underlying companies constituting the present system operated by the Pittsburgh Railways Company. It was apparently necessary, therefore, for the present management of the Pittsburgh Railways Company to raise this money by adding it to Capital account, with the result that possible permanent improvements, such as new cars and better tracks—for which it could otherwise have been expended —were delayed. *This failure to take care of renewals out of earnings is one of the chief causes of the present defective condition of the property.*

Loss of Business. The gross earnings have not been as great as was expected at the time of consolidation, as two periods of business depression have affected the entire District during the past eight years. At the same time, the efforts of the Company to curtail expenses, in order to offset the loss in anticipated earnings, has resulted in relatively reduced service and neglected maintenance of equipment. The natural effect has been cumulative, and the dropping off in business has been more marked than it would have been if the quality and amount of service had not been so decidedly reduced.

The Company has thus lost the good will of the patrons which should be one of its best assets, and the forbidding appearance of some of its cars is having a depressing effect on the business. This condition is, however, being slowly improved by the gradual addition of new and larger cars.

Inconsistent Routing. The routing of the cars is the result of development and not of design. More cars are run on some main streets than are needed, and at other places there is a decided lack of cars. The looping in the terminal or down town district leads to congestion, and the effort to operate cars "direct" from one locality to other localities causes confusion, and often infrequent service. The forcing of passengers to use certain routes by curtailing the transfer privilege is inconvenient, resulting in long waits on the part of the patrons, with resulting dissatisfaction. The lack of through routes across the business district, serving the short haul business, is not in accordance with the best accepted practice. The existence of routing agreements between the various companies, the franchise requirements for certain service in the outlying boroughs, the lack of turning facilities at the ends of some of the lines and the narrow streets which prevent the running of modern double truck cars, are disadvantages which should be removed or modified.

Cumulative Effects. It will be seen that the longer this situation is allowed to *drift* the greater becomes the accumu-

lation of difficulties, in fact they accrue at what might be termed a compound rate. Rebuilding follows redesign, capital is added to capital, combination follows competition, operating losses follow non paying extensions, rentals in the form of guaranteed dividends are paid to take over prior leases, capitalization increases and stock is issued as collateral for guaranteed bonds, wear and tear is neglected until the equipment becomes either practically scrap or an excessive burden for repair, depreciation is not recognized and obsolescence of equipment is followed by constantly growing losses of possible patronage due to inefficiency. A falling off in business is followed at once with a withdrawal of cars, which causes a still further reduction in patronage. Next comes the cutting down of the expense of cleaning, of inspection and of repair, and more cars break down and drop out of service, general dissatisfaction takes the place of pride, and the riding habit of the community is reduced to the demands of actual necessity. Thus *if something is not done to check the cumulative results of these serious defects, the usefulness of the railway as a public utility will rapidly diminish.*

Development of City Legislation.

After losing the control of the situation by neglecting franchise requirements there has been an effort from time to time to exercise the police and taxing power of the City by means of ordinances.

An ordinance in 1890 imposed certain regulations as to the running of the cars, the construction of the track and the placing of poles and wires. This ordinance also required the companies to pave and keep in good repair that portion of the streets between their tracks and one foot outside. The Company now complies with some of the provisions of this ordinance and, as to others, principally that relating to street paving, disputes exist between the Company and the City.

An ordinance in 1893 imposed a license tax of $60.00 per car per year upon cars wholly operated within the city, and $30.00 per car per year on cars operated only partly within the city limits. The Company and its predecessors paid this tax for some years, but now refuse to pay on the ground that the amendment of 1906, referred to below, repealed this ordinance.

In 1903, an ordinance was passed imposing a tax of 25 cents per foot upon each lineal foot of street railway track laid and maintained in the city, but this tax was held to be invalid by the State Supreme Court on the ground that the ordinance attempt-

ed to impose a property as distinguished from a license tax and that the City had no power to tax such property under its charter.

In 1906 an ordinance was passed amending the car license tax ordinances of 1893 and raising the amount of the tax to $100.00 per car per annum, but this ordinance was also held to be invalid on substantially the same grounds as above noted.

In 1910 there have been a number of regulating ordinances passed and these ordinances are now before the court for adjudication. One of these ordinances requires the Company to issue transfers so as to enable a passenger to ride between two points within the city for a single five cent fare. This ordinance was held invalid in the lower court on the ground that the City had no power to enact it under its charter.

Other ordinances limit the number of standing passengers which may be carried in any one car, requires the Company to operate a sufficient number of cars so that patrons should not have to wait more than fifteen minutes for a seat and requires the Company to keep their cars clean and in good condition. Suits are now pending to determine the legality of these ordinances.

A recent ordinance declares the rights of the Pittsburgh, Oakland & East Liberty Passenger Railway Company, and its successors to be forfeited in certain streets of the City for the failure to comply with the conditions in its charter and ordinances of the City requiring the Company to keep the streets in good repair, to pay a percentage of the earnings to the City and also to pay a car tax.

Suits of City against Companies. A number of suits in the courts are pending. The City has attempted in one of these suits to prevent the Company from bringing into the city the cars of suburban lines which have no charter or franchise rights within the city.

Suits are pending for the recovery of about $850,000 alleged to be due the City by virtue of the conditions in the charters of the companies and the ordinances of the City requiring them to keep the streets along the tracks clean.

There are also suits pending to fix the amount of compensation to be paid by the Companies to the City for the use of bridges owned by it.

The City has recently filed a bill in equity against the Pittsburgh Railways Company seeking to compel the Company to place in repair that part of the streets of the City occupied by its tracks and also to place its tracks in a state of good repair and to use modern methods of construction in this work.

Development of State Legislation.

Prior to 1905, parties organizing street railway companies specified the proposed route in their application for a charter and obtained municipal consent after the charter was granted. Since that date, municipal consent must be obtained before the charter is applied for. Previous to 1905 the Company simply authorized the construction of extensions by resolution of its Board, but in 1905 a change was made in the method of obtaining authority for constructing extensions by requiring the approval of the Governor. The consent of the local authorities has always been required, however, to the construction of extensions, as in the case of the original road.

At the same session of the legislature, 1905, a change was made as to the tracks of other companies which street railway companies might use, by requiring the consent of the other companies to such use. Before that time, companies might use portions of the tracks of other companies (at one time such portion was fixed at 2500 feet) without the consent of such other companies for terminal and other purposes.

The Act of 1901 authorized companies to lay out routes upon streets where tracks were not in constant daily use and forbade the granting of charter rights upon such streets to other companies during the time which said first companies had to begin and complete their work. By this Act companies were given two years in which to obtain municipal consent, two years more in which to begin work, and five years in which to complete their road. These provisions were amended by the Act of 1905, which imposed no time limit for the completion of the road, but provided that if the company should not complete its road within the time fixed by the municipality, it should be deemed to have abandoned the portion not so completed, but should have the right to operate the remaining portion.

In 1907 an Act was passed authorizing contracts between municipalities and street railway companies fixing the relative rights, duties and liabilities of the parties and providing for the acquisition of the property and franchises of the companies by the municipality.

At this 1907 session the following Acts also were passed:

Act empowering street railway companies to carry light freight and express matter subject to regulation by the local authorities.

Act conferring upon these companies the power of eminent

domain and making them common carriers of light freight and express matter. Incidentally this act allowed street railways to be built upon private property.

Act limiting the rate of fare in cities of second class to five cents for a continuous ride in one car.

In 1909 two Acts were passed, one allowing such companies to carry all kinds of freight and the other permitting them to connect their tracks with the tracks of steam railroads and to interchange traffic. In both cases, municipal consent was required.

Development of State Regulation.

Under the Constitution of 1874 and subsequent legislation, the Secretary of Internal Affairs of the Commonwealth is empowered to require corporations to report to him in such detail, practically, as he shall see fit, and recently that official has required all street railway corporations to report in compliance with the standard form of report for electric railways approved by the Street Railway Accountants Association in October, 1902, and adopted by the National Association of Railway Accountants in 1903. These reports are a step in advance of what the Department has required heretofore. This official is authorized, under the Act of 1874, in case any citizen shall charge, under oath, any corporation with transcending its corporate functions or infringing upon the rights of individual citizens, to investigate such charges and require from such corporation a special report, and in case he believes the charges are just and the matters complained of are beyond the ordinary province of individual redress, he shall certify his opinion to the Attorney General of the State, whose duty it shall be, by an appropriate legal remedy, to redress the same by a proceeding in the courts at the expense of the State. He may also, in case of doubt, call before him witnesses and examine them, under oath or affirmation, reducing their testimony to writing and filing the same, to explain the reason of his action in any case.

In 1907, the State of Pennsylvania enacted a law establishing a Railroad Commission, with power to inquire into the acts of railroads including street railways and certain other public corporations, to ascertain whether or not they were complying with the conditions of their charters, were fulfilling their corporate obligations, were usurping powers not conferred upon them, or were guilty of practices which were unfair or unjust, in relation to fixing of rates, and all other matters relating to transportation.

This Commission has the power to decide what practices, in

relation to transportation, are fair, and to make recommendations fixing the standards of service to be observed by the corporations subject to its jurisdiction. In case the Commission finds the corporations are not complying with the conditions of their charters, or are usurping powers not granted to them, the Commission is to report the matter to the Attorney General. The powers of the Commission under the Act are somewhat vague and the methods of putting its recommendations into force are still more vague. The courts have not been called upon to pass upon any case as yet where the corporation refused to comply with the recommendation of the Commission, and the course to be followed in such a case is a matter of some doubt. This Act enables the Commission to inquire into proposed stock and bond issues, but does not give them any right to regulate the same or impose conditions upon them.

Investigation and Reports.

Within the last five years, more or less official notice has been taken of the transit situation in Pittsburgh as evidenced by the following list of communications.

Report on Transit Conditions by Sub Committee on Rapid Transit to the Mayor, Geo. W. Guthrie..Feb. 4, 1907
The Transit Situation in Pittsburgh, an article in Pittsburgh Survey Report, by John P. Fox.....Feby., 1909
Message of the Mayor, Geo. W. Guthrie to Councils March 8, 1909
Report of Stone & Webster, Consulting Engineers to Pennsylvania State Railroad Commission....Feby. 20, 1909
Recommendations of the Pennsylvania State Railroad Commission..... April 24, 1909
Report of Henry C. Wright to Mayor Wm. A. Magee, Aug. 21, 1909
Communication to Pennsylvania State Railroad Commission by Mayor William A. Magee.....Nov. 29, 1909
Report on City Planning for Pittsburgh to Pittsburgh Civic Commission by Messrs. Olmstead, Freeman and Arnold.....Dec. 11, 1909
Report to Pennsylvania State Railroad Commission by Emil Swensson.....March 26, 1910
Reply of Pittsburgh Railways Company.....May 10, 1910
Communication to Pennsylvania State Railroad Commission by Mayor William A. Magee.....May 10, 1910
Recommendations of Pennsylvania State Railroad Commission.....June 24, 1910
Reply of Pittsburgh Railways Company.....Aug. 11, 1910

Recommendations of State Railroad Commission.

As the result of two investigations following complaints made by Mayor Guthrie and Mayor Magee, the following recommendations have been made by the State Commission:

RECOMMENDATIONS OF APRIL 24TH, 1909.

"*First:* That additional service be provided by the Railways Company during the period commonly known as the "rush hours" on the following routes and to the exact amount indicated opposite each:

ROUTE.	DESIGNATION.	TRIPPERS PER HOUR.
203	Heidelberg	3
204	Crafton—Ingram	3
205	Crafton—Thornburg	3
213	Mount Washington via Tunnel	6
307	Arlington Avenue	4.
403	Wilmerding via Homestead	2
706	Wilkinsburg via Frankstown Avenue	5
714	East Liberty Express via Liberty Avenue	5
1,001	Sharpsburg via Penn Avenue	5
104	California Avenue to Avalon and Emsworth	4
207	Elliott and Sheraden	4
303	Knoxville via Tunnel	6
901	Wylie, Bedford and Herron Avenues	5

The maximum number of cars on the most congested loop with this increased schedule would be one hundred and twenty (120) per hour. Car movements will necessarily have to be facilitated in every possible way to get satisfactory service from this headway, and the actual schedule of the different routes may have to be modified to properly take care of the increased number of cars; this, however, is an operating matter to be worked out by the traffic department of the Company.

Wherever possible, the long, double truck cars should be substituted for the smaller ones, and a still greater improvement in the service would be thus effected.

Second: That the Company station inspectors at every important point and that, so far as practicable, the municipal authorities secure to these Inspectors the authority to regulate the headways of cars on the various lines, to the end that a closer adherence to schedule may be maintained.

Third: That all important junctions in the terminal district electrically operated switches be introduced, or that the switches now in place be operated by employes of the Company other than those engaged in the operation of the cars.

Fourth: That the Company endeavor to at once improve the lighting arrangements in the short cars, and give more careful attention to the heating and ventilation of all cars.

Fifth: That every legitimate effort should be made to secure the speedy abolition of all grade crossings of steam railroad lines."

RECOMMENDATIONS OF JUNE 24th, 1910.

1. "That 50 additional closed motor cars of 56-seat capacity be ordered at once for delivery as speedily as possible.

2. That all cars be distributed over practicable routes according to the amount of travel, and during rush hours be scheduled to meet so far as possible the demands thereof; and that, outside of the morning and evening rush hours, a sufficient number of cars be run on all routes to accommodate the travel comfortably.

3. That hereafter there be annual additions to the rolling stock amply sufficient to provide for any increase in travel and to supply the loss from wear and tear.

4. That so far as the character of the various routes permits and the travel thereon requires, and as the wear and tear of the rolling stock demands its renewal, the old 28-seat car should be replaced by the 56-seat or other equally good large type of cars.

5. That routing and re-routing and the operation of short runs should be carefully studied and, from time to time, experimented with, as the City, the other municipalities concerned, and the Company may find advisable and practicable, until the best arrangement thereof is determined, and that thereupon publication be made of the several routes and the services thereon for the convenient information and guidance of the patrons, and that wherever now practicable, or hereafter rendered so, the terminal loops be shortened, the number of stops thereon decreased and the crossings of loops by each other avoided.

6. That all cars be regularly and thoroughly cleaned both inside and outside each day, with such additional cleaning during the day as the circumstances demand and permit, and that ample provision be made for prompt and full repairs as they may be required.

7. That the roadbed be maintained in first class condition, and that the power plants be made sufficient for every demand.

8. That persistent endeavor be made to keep the cars on schedule time. This is regarded as very important.

9. That the Company promptly determine the additional franchise privileges it regards as necessary for the most satisfactory and efficient service, and then make application to the respective municipal authorities for the grant thereof, and persist in efforts to obtain the same until a definite conclusion is reached.

10. That the endeavor to eliminate grade crossings of steam railroads be prosecuted vigorously.

11. That proper and adequate provision be made for the storage of cars near the terminal district, so that the cars can be readily run in for short trips and for the rush hour service."

Conferences Between City and Company.

In accordance with the suggestion of the Railroad Commission that "the City and Company should make an effort to adjust all differences and make all reasonable agreements and contracts necessary to accomplish the establishment of harmonious relations and a very satisfactory trolley service," the following letter was recently sent to the Railways Company by the Mayor of Pittsburgh.

PITTSBURGH, PENNA., October 14th, 1910

MR. J. D. CALLERY, President,
The Pittsburgh Railways Company,
Pittsburgh, Penna.

DEAR SIR:

As Mr. Arnold is about concluding his study of the surface traction situation in Pittsburgh and as you are no doubt making your plans for winter traffic, I beg now to suggest that the time has arrived for the Railways Company and the City to undertake the discussions of the various questions involved between them and particularly with reference to those matters included in the two recommendations of the Railroad Commission. I will attempt to enumerate all of the questions which I consider to be the most important but I do not do so in any sense that they should be exclusive of others which you desire to raise. I beg to suggest:

First: That you acquaint me with whatever changes and experiments that have been made or are being made in accordance with the directions of the Railroad Commission.

Second: That you furnish me with a list of the additional franchise privileges which you regard as necessary.

Third: That you furnish me with a list of the locations of the one (100) hundred new cars ordered a year and a half ago which presumably have all been delivered by this time and what provisions has been made for additional power.

Fourth: That you furnish me with a statement of your intentions with regard to the fifty (50) trailers to be delivered during the current month.

Fifth: That you inform me how far advanced the fifty (50) motor cars are which were ordered to be secured by the Railroad Commission.

Sixth: That you inform me what boroughs or municipalities have been requested by the Railways Company to grant consent for improvements and the nature of the improvements without which certain changes cannot be effected within the city. I am referring now to that statement of yours in your communication to the Railroad Commission.

Seventh: That you make arrangements to have a representative of yours meet with a representative of the City for the purpose of attempting a more equitable distribution of the existing and prospective cars during the rush hours; for a conference upon re-routing and short runs and upon the further extension of street regulation.

Eighth: That the Director of the Department of Public Works be brought in touch with the proper officials of the Railways Company to confer upon the various questions of street repaving and track construction.

Ninth: That an attempt be made to reach a conclusion with regard to the widening of the Smithfield Street bridge and the separation of the grade crossings at Try Street.

Tenth: That an effort be made to effect a separation of the grade crossings at Thirty-third street and Liberty Avenue by a conference with the proper officials of the Baltimore and Ohio Railroad Company.

Eleventh: That you furnish me with a copy of your winter schedule showing the proposed headway for non-rush hours as well as the rush hours, that is to say, for the entire period of the day and inform me what provision has been made or is being made for maintaining schedules in accordance with the second recommendation of the State Railroad Commission under date of April 24th, 1909 and the eighth recommendation under date of June 24th, 1910.

Twelfth: That you inform me what provision has been made for storage of cars.

Thirteenth: That you inform me what provision has been made for the heating, ventilating and lighting of cars.

Fourteenth: That you inform me what provision has been made in regard to automatic switches in accordance with the third recommendation of the Railroad Commission under date of April 24th, 1909.

Fifteenth: That you lay before me any other plans which you have in mind for the improvement of service not included in the above, in which you consider that the City may have an interest or in which the City administration can be of any assistance.

Yours very truly,
(signed) WILLIAM A. MAGEE,
Mayor.

New Connections and Extensions.

In answer to the Mayor's letter, the Railways Company submitted for consideration a rerouting scheme* for the downtown district, incorporating

LIST OF STREETS UPON WHICH TRACKS ARE NEEDED.

31st and 32nd Streets....Penn to Liberty and connecting curves.
12th Street.....Penn to Liberty and connecting curves.
21st and 22nd Streets...Connecting curves at Penn and at Liberty.
9th St. Bridge Loop....Curves at 9th and Penn and 7th and Penn
Market Street .....Water St. to Fifth Ave. and connecting curves.
Ferry Street.....Fourth Ave. to Water St. and connecting curves.
Water Street.....Ferry Street to Wood Street.
1st and 2nd Avenues...Wood St. to Grant St. and connecting curves.
3rd Avenue.....Grant Street to Ross Street.
Ross Street.....Third Avenue to Forbes Street.
Diamond Street.....Wood Street to Grant Street.
Old Avenue.....Forbes Street to Fifth Avenue.

Center Avenue and Highland Avenue Curve.
Carson Street at South 17th Street and South 18th Street.

*See drawing and explanation in Re-routing chapter, page 162.

Woods Run Avenue loop above Brighton Road.
Lincoln Avenue "Y".
Smithfield Street Bridge.
Bridges to be raised on Carson Street to McKees Rocks.
Louisa Street loop—Boquet.
Curve—Fifth Avenue and Craig Street—Cathedral Corner.
Curves—Brady and Forbes Streets.
Curves—Fifth Avenue Extension and Frankstown "Y".
Carson and 30th Street "Y" or loop through 30th Street.
Tracks on Craft Avenue from Fifth Avenue to Forbes Street.

This list was not intended to be exact or complete, but was submitted as a tentative requirement for new connections and extensions.

Analysis of the Present Situation.

From the foregoing recent history it will be seen that both the City and the Company are waiting for the other to act. The City desires to know *when* all the cars recommended by the Railroad Commission and promised by the Railways Company are to be delivered, *where* they are to be run and *when* the tracks and paving will be repaired. The Company has submitted a rerouting plan and a list of additional streets over which it desires franchises, but makes no definite answer as to the cars. There is every reason why more cars should be furnished by the Company and plenty of evidence as to the desirability of rehabilitating the tracks. There are also good reasons why the City should grant permission for new connections so as to permit the improved routing of cars. *But why is not something being done?*

Why the Company Does Not Act.

The Company seems to be *uncertain* as to its future policy because

(a) The system has been overexpanded and parts of it already rebuilt several times out of capital account.

(b) The organization agreements resulted in heavy fixed charges and were made apparently without definite provision for renewals due to obsolescence and inadequacy.

(c) Several business depressions in the District have resulted in an unsettled confidence in the future.

(d) A constantly increasing deficit makes it difficult to interest new capital for necessary improvements.

(e) Operating expenses have increased out of proportion to income on account of the increased cost of labor and material and also on account of past curtailment of maintenance.

(f) The attitude of the City during the past administration was antagonistic and the present administration has kept the Company in a defensive position.

Why the City Does Not Act.

The City cannot be expected to "turn all the rest of its streets over to the Company" because

(a) Provisions in past franchises seem not to have been lived up to by the Railways Company.

(b) The power of the City to regulate service and fares has not been established.

(c) The City's control of the streets as to the repair of paving along tracks is in doubt.

(d) The power of the City to specify transfers or routes on which the cars are to run is not certain.

(e) There is no assurance that the present Company has the financial ability to take care of constantly growing demands.

(f) The surrender of additional streets in the downtown district would eliminate the possibility of competition.

The question of extensions apparently opens up again the relation between the City and the Company. If the City grants assure the Company protection from competition, then it would appear that the natural result must be some form of public control which would insure adequate service, and at the same time result in a fair return on the actual investment.

Why Company and City Should Act Together.

There is every reason to believe that the old system of granting franchises without retaining the power of public control or right to purchase does not produce a satisfactory transportation system.

The exploitation of the system as an "investment" creates

a growing feeling of suspicion and unrest on the part of the public that it is not getting all of the service it should, and this dissatisfaction finds expression in suits and regulating ordinances.

The operating Company finds that the net returns after paying operating expenses for the service which public pressure demands, is not sufficient to justify its capitalization.

It will thus be seen that the expectations of neither party are fulfilled under the present arrangement, and both should therefore be interested in devising and agreeing upon a more satisfactory and permanent plan.

Basis For A Permanent Settlement.

Drawing upon the Chicago and Cleveland settlements for experience, it is apparent that a continuous working agreement should be based upon at least the following fundamental considerations.

Fair Return on Investment. Should be assured on the basis of an agreed rate of return on the actual present value of the property (cost to reproduce minus depreciation); this value to be determined by an appraisal of the present physical property to which should be added an agreed allowance for development expenses.

A fair return should also be allowed upon all money spent upon the property to rehabilitate it and put it in first class operating condition so as to give adequate service, as well as on all moneys spent on extensions and improvements.

Rehabilitation. Property to be rehabilitated and maintained up to an average operating condition equal to at least 70% of its cost to reproduce new, all future maintenance to be paid for out of operating expenses, and renewals to be made out of the earnings of the property.

Improvements and Extensions. The system should have the benefit of the latest improvements in the art and its equipment should be kept up to date. To take care of constantly increasing demands of the City's growth new capital should be available for extensions.

Adequate Service. To be measured in definite terms, preferably in a percentage of the income, so that the greater the yearly income the better will be the service.

Routing. The re-routing should not only eliminate useless car miles, but should provide a reasonable number of through routes so as to make it possible to pass through

the center of the city to the further limits of the "through zone" without transferring or paying an additional fare.

Transfers. Should be provided so that a continuous single ride can be secured in one general direction with at least one free transfer.

Publicity and Control. All of the technical details, expenditures of money on property, methods of operation, standardization of accounts and general auditing of books should be under the supervision of some Board (upon which both the City and the Company might be represented) empowered with authority to initiate reasonable improvements, control operation and cause its acts to be enforced. The records of this body should be open to the Public.

Right to Purchase. The new agreement should be in the form of an indeterminate permit or franchise, sometimes called a "tenure during good behavior." Such a grant can be terminated by the City at any time upon the payment of a fair compensation for the value of the property, exclusive of franchise values.

It would be unreasonable to expect such a radical change to be accomplished at once. All permanent progress takes time. The City will hardly be ready for such a settlement until it realizes that transportation must be handled as a District problem, and therefore some form of District organization must be provided. The Company, presumably, would not be prepared to surrender its perpetual franchise rights for the privilege of an indeterminate grant *unless the affairs of the combined system reached an acute stage due to the continued accumulation of deficit and depreciation obligations.* In the meantime, something should be done.

A Suggested Program.

In order to show its good intentions, let the Company disclose to the public its present plans in regard to those recommendations of the State Railroad Commission which can be carried out without waiting for the City. These items include

The placing in service of 150 new motor cars and 50 new trailers.
The lighting, heating and ventilation of all cars.
The maintaining of schedules by special inspection.
The improvement of schedules.
The maintenance of track and paving.

In order to show the sincerity of the administration, let the Mayor or Councils, or both, make a definite decision in regard to the several matters which are pending, making some concessions, if necessary, in order to encourage a spirit of co-operation. These matters include

The widening of Smithfield Street bridge.
The plans for Try Street crossing.
Several grade separation projects.

In order to demonstrate the benefits to be derived from friendly conferences leading to a better understanding of the actual facts of the every day transportation difficulties, let the Mayor appoint a representative to have access to the records of the Company covering the operation of the system—particularly the schedules; the trip reports, showing the number of passengers carried; the time reports, showing delays and such other information as will lead to an intelligent analysis of the service and possible improvements in the equitable distribution of the cars available. Thus the "open door" policy between the City and the Company will be maintained to the mutual benefit of both and a foundation of facts can be gradually provided upon which to base an ultimate permanent settlement, which for the mutual benefit of both the City and the Company cannot depart very far from the lines suggested.

FUTURE TRANSIT DEVELOPMENTS.

Analyzing probable future earnings—Increase in earnings per capita—Earnings in other cities increasing as a rule as the square of the population—Reasonable limits of investment in increased facilities—Reasonable rate of future investment—Future developments of surface system—Specific requirements—Regulation by commission or municipality—Preliminary report on Rapid Transit.

It is always hazardous to make prophecies, but it is equally dangerous to proceed without some conception of the future. In our American cities, there is every evidence that their growth, and particularly the development of their transportation systems has resulted in a series of blunders which are the direct results of an inadequate conception of transportation needs. The problem for the present generation is to rearrange the more or less haphazard combination of streets and transit facilities that have grown up within the city and to substitute therefor a comprehensive plan for both the city and its transportation. The two go hand in hand. For accomplishing this most important task the equipment should be—1st, a thorough record of the past growth and the present demands—2nd, a knowledge of the limitations which must be contended with—3rd, a conception of the possibilities, and then—4th, an ideal toward which to strive with a well founded faith in the future.

Possibilities of Future Earnings.

In forming a conception of the possibilities of the transportation developments in any district, it is desirable to get a firm grasp on the fact that the "riding habit" of the people increases from year to year as the community grows, as its business, family and social life becomes more and more complex from period to period, and as its facilities of intercommunication are improved. The record of the Pittsburgh District as well as a study of the results* from communities of similar size, show that

*See the graphical comparison of the growth of traction earnings and the population of all American cities in the insert contained in the chapter "Traction Results in Largest American Cities."

"earnings per capita" may conservatively be taken as increasing in proportion to the increase in population, that is, when the population *doubles*, the average expenditure for transportation per person will also double. To show what this means, the following figures will be of interest.

RATE OF GROWTH OF INCOME FROM TRANSPORTATION.

POPULATION	EARNINGS PER CAPITA	ANNUAL PASSENGER INCOME
1,000,000	$10.00	$10,000,000
1,250,000	12.50	15,625,000
1,500,000	15.00	22,500,000
1,750,000	17.50	30,625,000
2,000,000	20.00	40,000,000

The important point to notice is that within reasonable limits the *annual transportation income of any large center of population increases approximately as the square of the population.* In the Pittsburgh District, the result will be that when the population reaches the two million mark, the earnings from transportation will have *increased by $30,000,000* per year. There may be some who will question the probability of the Pittsburgh District increasing from one million to two million in population, but as long as there is a reasonable possibility of such an increase it would be a mistake to form our conception as to the future transportation developments on a lower basis.

Investment in Increased Facilities.

In determining upon the *plan* for the building of future transit facilities, it is important to know what amount of money may reasonably be invested for each dollar of increased income. All of the developments of the science of transportation have a decided tendency toward reducing the actual operating cost of moving passengers. On the surface lines, the use of larger cars reduces the cost per seat per mile; the electrified railroad lines are operating at a less cost per car mile with electric motors than they formerly did with steam locomotives, and subway cars of twice the capacity of surface cars can be run at double the speed and at almost half the operating cost per car mile of the trolley car. In other words, a larger investment per dollar earned can be made with the more modern equipment, and this fact expressed within reasonable limits in actual figures may be stated as follows:

For Surface Systems each additional dollar earned will justify an investment of $3.00 to $4.00.

For Electrified Railroads, each additional dollar earned will justify an investment of $4.00 to $6.00.

For Subway Systems each additional dollar earned will justify an investment of $6.00 to $8.00.

Following is an approximate estimate of the summation of future expenditures for transit facilities in the Pittsburgh District to be made by the time the District has a population of 2,000,000. This is believed to be conservative and possible of execution.

Approximate Expenditures for Transit Facilities.

Share Apportioned to	Increased Annual Earnings	Average Rate	Additional Investment
Surface Systems	$15,000,000	$3.50	$52,500,000
Subways and other "Rapid Transit" facilities	10,000,000	7.00	70,000,000
Electrified Railroads	5,000,000	5.00	25,000,000
Total	$30,000,000		$147,500 000

This means that a comprehensive transportation program should involve the plans for the expenditure of between $140,000,000 and $150,000,000 in the Pittsburgh District. *These figures give a fair idea of the magnitude of the Pittsburgh transportation problem.*

Rate of Future Growth.

If it requires an investment of $140,000,000 to provide for additional annual earnings of $30,000,000, the question is *when* can the demand anticipated be expected and how far in advance should the expenditures precede the demands. It may be said that an exact estimate is impracticable, but it is better to have even an approximate estimate than no conception at all.

A study of the rate of growth of the population of Pittsburgh, of the surrounding towns and of Allegheny County, indicates that the population served by the present surface system will increase from 1,000,000 to 2,000,000 persons in about thirty years time. This refers to the so-called Pittsburgh District, which has shown an even more rapid growth * than Allegheny County alone. A more conservative estimate would be that the population would be doubled in forty years. Taking an average of thirty-five years and remembering that if the riding habit is to be expected to

*See population study curves on accompanying insert, opposite page 140–41.

increase it must be cultivated by providing facilities somewhat in advance of the actual demand, we may arrange a table of possible expenditures as below in which it will be noted that the annual requirements for investment are greater for the later years of the period.

APPROXIMATE SCHEDULE OF EXPENDITURES FOR TRANSIT FACILITIES.

YEARS	PERIOD	AVERAGE ANNUAL RATE OF INVESTMENT	TOTAL
1910 to 1915	5 years	$3,000,000	$15,000,000
1915 to 1925	10 "	3,500,000	35,000,000
1925 to 1935	10 "	4,000,000	40,000,000
1935 to 1945	10 "	5,000,000	50,000,000
	35 years	$4,000,000	$140,000,000

To plan the future expenditures for transportation for a period much longer than thirty-five years would not be wise on account of the possibilities of radical changes in the state of the art. On the other hand to lay out a scheme which would not take into account the possibilities for quite a length of time would not be comprehensive. And to proceed without any plan at all would mean to continue blundering along as has been done by many in the past with the result that some properties are in a run down condition without sufficient funds for rehabilitating them or for extensions.

The Future Development of the Surface System.

The present surface system need have nothing to fear from a "rapid transit" development, for the building of suitably located subways and electrified railroad lines will help the surface earnings rather than detract from them. Eventually the surface system should act as a collecting and distributing agency for the rapid transit lines, and as density of traffic develops, it is not too much to expect that some form of transfers will be issued between the subway, the electrified lines and the surface system. In other words, the trolley line should do the retail business in single car units and the main trunk rapid transit lines should do the wholesale business with trains of cars.

Speed and economy will be secured by the "rapid transit" lines and convenience provided by the surface system. This conception of the functions of the surface system makes its position in the District one of the greatest importance. If for all time, this system is to collect an income at the rate of more than $10.00 per capita per annum, and is in a position to affect the health, happiness and well being of every person in the District,

then it would seem that the public have certain rights which ought to be expressed in definite form.

In various States, this *right to regulate* is being intrusted to special commissions, which are given power to regulate service, to fix rates, to pass upon franchises and permits for extensions and to control the issue of securities so as to limit the profits to a fair return on the investment. For this purpose physical valuations are being made and standard systems of accounts are being introduced. The question of depreciation is becoming a live issue and publicity of records an established fact.

It is reasonable to expect that the traction situation in the Pittsburgh District must, sooner or later, develop along these or similar lines.

Whether actuated by demands of the public or determined by the dictates of good management, the physical part of the present property should first be thoroughly rehabilitated and at the same time improved so as to bring the equipment up to date.

As a rule, extensions should be made only when the increased business will justify the investment; otherwise new lines which will exploit new territory should be financed at the partial expense of the district benefitted in such a way as not to become an excessive burden upon the rest of the system.

The territory already covered should be provided with adequate service and the great stretches of unoccupied land already reached by the trolley lines should be developed.

There is no reason why the average income per mile of track already in place should not be very greatly increased, and when this occurs, the property will pay well upon a fair valuation.

The Rapid Transit Problem in Pittsburgh.

According to the schedule of approximate expenditures for future transit facilities in the Pittsburgh District, nearly two-thirds of the total amount to be expended to secure a comprehensive system is to cover the cost of electrified steam roads and of subways and other "Rapid Transit" facilities. In other words, notwithstanding the magnitude of the problem of furnishing adequate service on the surface system, that of providing rapid transit for the future needs is fully twice as great. The situation at present in connection with Subways and Electrified Steam Roads is covered in the following *Preliminary Report on Rapid Transit which was made in order to meet the subway situation in Pittsburgh which arose during the preparation of this report.*

Preliminary Report on Rapid Transit.

An exposition of technical and other elements in the execution of a rapid transit enterprise—Improvements now available—Elevated roads disadvantageous—Subways an eventual necessity in Pittsburgh—Technical elements—Relation of earnings and expenses—At least 12% annual return on first cost necessary—How increasing earnings per capita enhance the probabilities of building subways—Why certain density of population is necessary to support rapid transit—Advantage of combined subway-Surface system as trunk and feeder—The important function of apartment dwellings—Financial considerations—Necessity of providing for depreciation and contingencies—Detailing various methods of financing by private and city capital or credit and by assessment—Return on investment—Why subways will not pay at first—Problems requiring investigation.

PITTSBURGH, PENNA., June 29, 1910.

HONORABLE WILLIAM A. MAGEE,
Mayor of Pittsburgh.

SIR:—

In answer to your various questions in regard to the possibilities for real Rapid Transit in Pittsburgh and the Pittsburgh District, I desire to make the following preliminary report:

I. *The Improvements Available* at the present time to provide better "rapid transit" facilities for the District are

(a) Elevated roads,
(b) Subways and
(c) Electrification of suburban terminals of steam railroads.

II. *Elevated Roads.* The only available location for an elevated system in the down town business district would be upon the outlying streets along the rivers, as the structure would probably not be tolerated in the narrow streets of the more congested central areas. This out-of-the-way location would place an elevated road at a disadvantage.

Elevated structures designed to carry the surface cars around Herron Hill would be expensive and the operation of single car

units would so limit the capacity of the tracks that it is doubtful if sufficient additional car miles could be operated to justify the investment.

III. *Subways.* A subway between the down town business district and certain centers in the outlying districts appears to be a natural development. It is probable that one section of the city will be ready for a subway before the other sections, but eventually all parts of the city should be connected by some unified system of sub-surface transportation.

A subway is admirably adapted to overcome the natural divisional obstacles, such as hills, ravines and rivers which now separate the various communities. And as a civic improvement, the building of a subway will *eventually* become a necessity in order to remove the *increase* in passenger traffic from the surface of the streets. *The present questions however, are where and how soon should subways be built and under what financial restrictions.*

Technical Elements of Subway System.

(a) *First Cost.* The first cost of a double track subway, fully equipped, may be estimated as between $1,000,000 and $2,000,000 per mile of single track, depending upon the physical difficulties, size, elaborateness of design, number of stations, amount of rolling stock and other equipment, value of real estate necessary for stations, terminals, shops, yards, etc. A subway system for Pittsburgh should hardly be undertaken unless an expenditure of at least $30,000,000 is contemplated, half of this amount, at least, to be spent for the sections first built.

(b) *Operating Expense.* Experience has shown that the ratio between operating expenses and gross earnings, under subway conditions, varies between 40 and 60% with a fair average of 50%. The average operating expense of a surface system is from 60% to 70% of passenger earnings, and it is the fact that subways can be operated at a relatively lower percentage that justifies the larger investment in situations where the density of traffic is great.

(c) *Earnings.* The annual earnings from operation should amount to not less than 10% of the first cost, and seldom will amount to more than 15%, for before reaching this latter figure there, no doubt, would arise demands for extensions. These figures indicate on what narrow margins enterprises of this character must be financed. Under Pittsburgh conditions, I believe that average annual earnings from passengers equal to at least

12% of the first cost of the system will be necessary to make a subway practicable.

(d) *Earnings per capita.* If the first section of the subway must earn an amount equal to 12% on $15,000,000 or $1,800,000 per year, the question is —when will it be possible to build it?

The earnings per capita of the surface system are now about $10.00 as an average, but certain residence sections of the City run as high as $28.00 per unit of "sleeping population" of the District.

Earnings per capita increase at a rate not less than the rate of increase in population, and often at a greater rate, depending on the riding habits of the community. Therefore at $10.00 per capita, the subway must serve 180,000 people in order to earn $1,800,000 yearly; at $20.00 per capita, only one-half this number or 90,000 people would be required. A conservative estimate would be that if a subway can be designed to serve 150,000 people contributing $12.00 each per annum to the subway in addition to their use of the surface system, then an initial investment of $15,000,000 would be justified, or at the rate of $100 per person served.

(e) *Density of Population.* At present the *maximum* density of population in Pittsburgh over any considerable area is about 100 persons per acre, although one ward, the old Seventh, had a density of nearly 200 per acre; but in many residence districts, such as the East Liberty section, the density is as low as 30 per acre. In New York the density per acre for the lower "East Side" is about 700 per acre, and in Harlem, which is the best contributing district for the New York subway, the density is 150 per acre, which is the same as the average for the entire island of Manhattan.

At 100 per acre, 150,000 people would occupy 1500 acres or 2.35 square miles, while at 50 per acre, the district required for 150,000 people would be twice as much or 4.7 square miles. It is very probable, with the opportunities which Pittsburgh has of spreading out, that there will not be sufficient increase in land values to justify whole blocks of high apartment buildings such as are found in New York City. But there, no doubt, will be considerable development in the line of apartment dwellings, which will raise the present average density of population in many sections, although it will not be safe to count on large contiguous residence areas where the average density will reach as high as 100 per acre. This would indicate that the first section

of the subway should be designed if possible to serve an area of about four square miles.

(f) *Combined Surface and Subway Systems.* In order to reach the amount of territory that will secure patronage to justify a subway, it will be wise to count on a combined system using the subway as a main trunk line and the surface railway as a means of collecting and distributing the passengers over a wide area. Furthermore, in order to use the tubes to best advantage, they should be located and designed so as to accomodate suburban trains coming into the city over the various lines of the present railroads, which may be electrified eventually. With these two auxiliary systems contributing to the earnings of the subway, it will be unnecessary to be so dependent upon the earnings of the territory directly contiguous to the main trunk line.

However, to secure this "transfer" and "through" business, it will be necessary to design a subway for real rapid transit by eliminating the stops in the short haul territory just outside the business center of the city and to operate trains instead of single car units.

(g) *Successful Subway Design* in Pittsburgh will apparently involve the location of the subway in territory which is capable of being built up with apartment houses, the selection of station sites convenient to transfer to a surface system, and the design of terminals which will make connections with electrified suburban lines. The configuration of Pittsburgh with its probable growth in population lends itself to the successful meeting of all these conditions. But to disclose the exact location of a subway before the property is secured for stations and terminals, will unnecessarily hamper the enterprise with a too heavy real estate burden. In general, it may be said that the first section of the subway should connect the down town district with East Liberty, with two stations in the business center and about three stations in the East Liberty district. The second section of the subway should be built under the river to Allegheny, and the next two sections should consist of loops in the business center and an extension to the South Side.

Financial Considerations.

Any subsurface transportation system, to be permanently successful, should be able to carry the following financial burdens:

1. Operating expenses including taxes, damages, insurance and maintenance, which will vary from 40% to 60% of the passenger income, depending upon the volume of traffic.

2. An annual Depreciation Fund which will vary from 3% to 5% of the cost of equipment only.

3. An Amortization Fund which, at 1% per year on cost of construction (compounded at 2.5%), will retire the investment in *structure* in fifty years; or at ½% per year, would amount to the first cost of construction in seventy-five years.

4. A Contingent Reserve Fund to take care of extraordinary accidents and other unforseen contingencies, which fund should accumulate and be kept invested until it reaches about 5% of the total cost.

5. Interest on Cost, which at present may vary from a maximum of about 8% with private capital down to about 4% with municipal credit.

6. Discount Fund, which should offset the discount on bonds or other similar indebtedness in about twenty years.

7. Surplus Profits, which in case of private ownership, should be divided with the City on some equitable and agreed basis or used for building extensions.

Methods of Financing Subways.

Four subway systems have been built in this country: those in Boston, New York and Philadelphia.

The first Boston subway was constructed by the city, and was rented to the local railway company on a basis of not less than 4⅞% annual rental upon its total first cost. Arrangements recently have been made, however, for the Boston Elevated Railway Company to finance the Cambridge extension from Boston, with its own capital.

The original subway of the Interborough Company of New York was built with money raised upon bonds guaranteed by the City's credit. This money was used in the construction of the subway itself, but the equipment was furnished by a private company which was given the privilege of operating the subway for a period of 50 years with a possible extension of 25 years. The subway of the Hudson and Manhattan Company was built entirely with private capital, but the company pays an agreed varying annual rental for the use of such streets as it occupies on Manhattan Island.

The Philadelphia subway was built entirely by private capital and is used as a down town terminal for both elevated and surface cars of the Philadelphia Rapid Transit Company.

The various methods which have been recognized or suggested for financing the cost of subways may be briefly recapitulated as follows:—

(a) *Private Capital for Building, Equipment and Operation.* Length of franchise may be for (a) short term, (b) long term or for (c) indeterminate term. Right to purchase should be retained by the City.

(b) *City Credit for Construction, Private Capital for Equipment.* To be operated by contractor for a term of years. Sinking fund should be provided to retire City bonds used in construction. City should have the right to purchase equipment at a fair valuation at the end of the contractor's lease.

(c) *City Credit for both Construction and Equipment, Private Operation.* To be operated by contractor on bonus principle. Sinking funds to be provided for retiring cost, for depreciation and for operating reserve.

(d) *City Credit for both Construction and Equipment, Municipal Operation.* Municipal construction and operation without the use of any private enterprise whatsoever.

(e) *Assessment.* Part or all of the cost to be raised by long term assessment on the property benefitted, preferably without accumulation of interest. In case of very poor territory the loss from operation during the first years, while business is being developed should also be financed by assessment.

Return on Investment in Subway.

The earnings and net returns will depend on the following:

1. Density of population served, and rides per capita.
2. Equitable arrangement for exchange of transfers between the subway and the collecting and distributing surface system.
3. Use of subway as a down town terminal by electrified branches of present steam lines.

In my opinion a subway in Pittsburgh will pay *eventually,* but there will be a loss during the first years of operation, and particularly so if it be built too soon or upon too large a scale. To insure the stability of the enterprise, this deficit must be offset by the profits made during subsequent years. Therefore, in order that the turning point, when earnings exceed *operating expenses plus annual fixed charges,* be not deferred too long, the subway should not be constructed until definite arrangements

have been made with existing transportation systems for the joint use of the subway to the mutual advantage of the companies and the traveling public.

The operating expenses may be controlled, to a certain extent, as the service rendered may be made to suit, within limits, the traffic available. But the *annual fixed charges* will be the result of preliminary arrangements which cannot be reduced without financial loss to the original investors.

To elucidate, the First Cost will depend upon

(a) The actual cash cost of the property.
(b) The profit to be allowed the contractor.
(c) The interest paid during construction.
(d) The discount for underwriting funded debt.
(e) The profit to be allowed the promoter.

And the *Annual Fixed Charges*, after paying operating expenses, (including maintenance, taxes, damages and insurance) will depend on what is allowed for the following items:

(a) Interest on funded debt.
(b) Depreciation.
(c) Sinking fund for retiring cost of construction.
(d) Reserve fund for contingencies.
(e) Discount fund to offset discount on bonds.
(f) Dividends to reward enterprise or to cover a fair return on the investment.
(g) Percentage, if any, to be paid the City for its share of gross or net earnings.

Problems Requiring Investigation.

In order to determine, more definitely, the prospects of building a subway in advance of actual needs, so that it may become an important factor in influencing the extent and character of the growth of the City and District, it will be desirable to proceed along the following lines of inquiry:

1. Ascertain the "best terms" which private capital will offer or accept for building, equipping and operating the subway and for giving the City the right to purchase.

2. Secure by legislation the right for the City to issue bonds of a type self supporting and independent of the debt limit, so that money for purchasing or constructing a subway and possibly for equipping it also, may be secured by means of the City's credit, and thus reduce, to a minimum, the fixed charge for interest.

3. Ascertain what the present street surface railway company will do in regard to interchanging transfers with the subway.

4. Ascertain what the steam railroad companies will do in regard to electrification of their suburban tracks and renting the use of the subway as a down town terminal or for a through passenger connection for suburban trains.

5. Determine, by comparing the present census with others, the rate of growth of the sections which may be affected by rapid transit development.

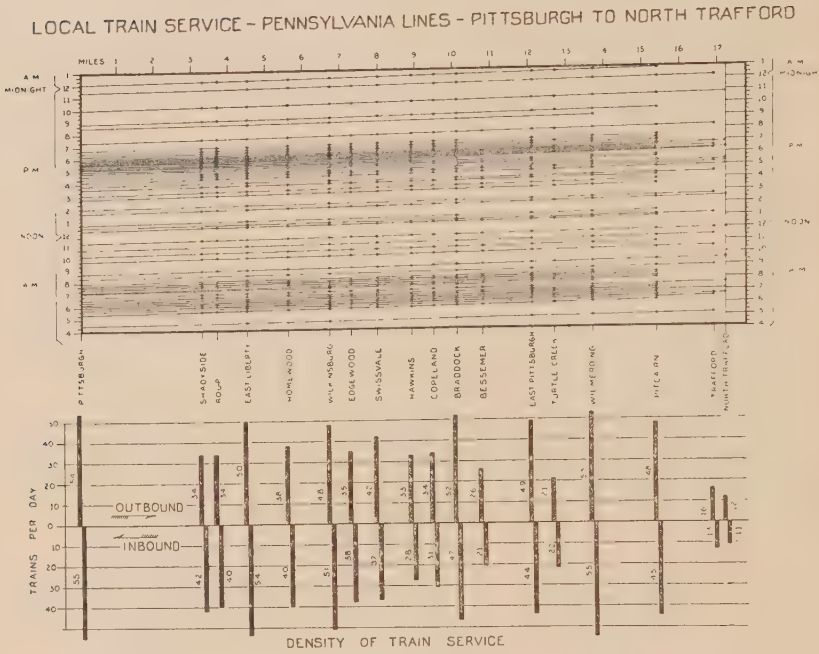
6. Ascertain the probable increase in value of real estate in the districts to be served in order to determine whether or not this increase in value of land will justify the building of apartment houses in sufficient numbers to result in a density favorable to subway operation.

7. Investigate the possibilities of raising all or part of the first cost of a subway by assessment on the land benefitted by the improvement.

Respectfully,

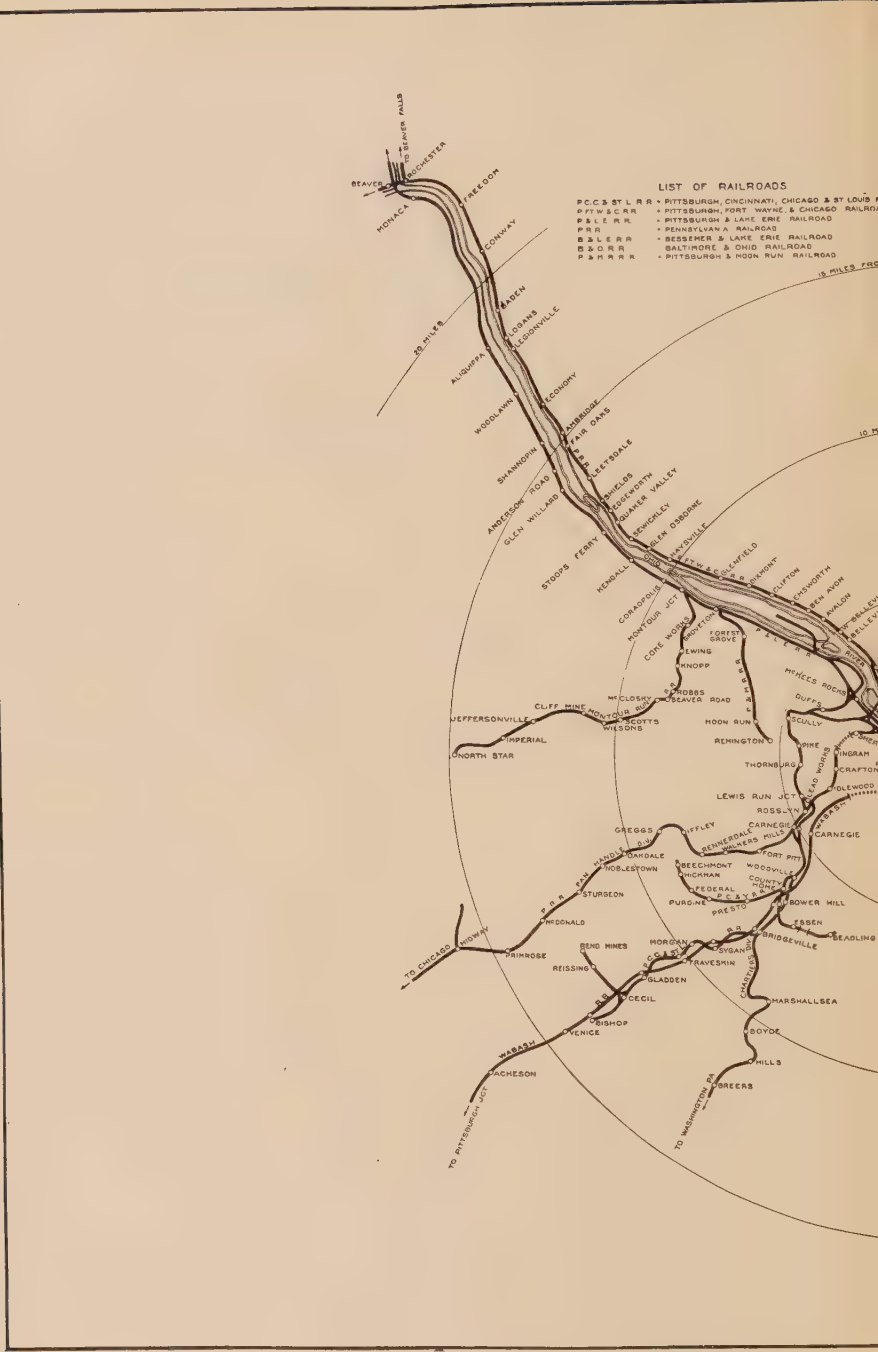
(Signed) BION J. ARNOLD,

Consulting Engineer.



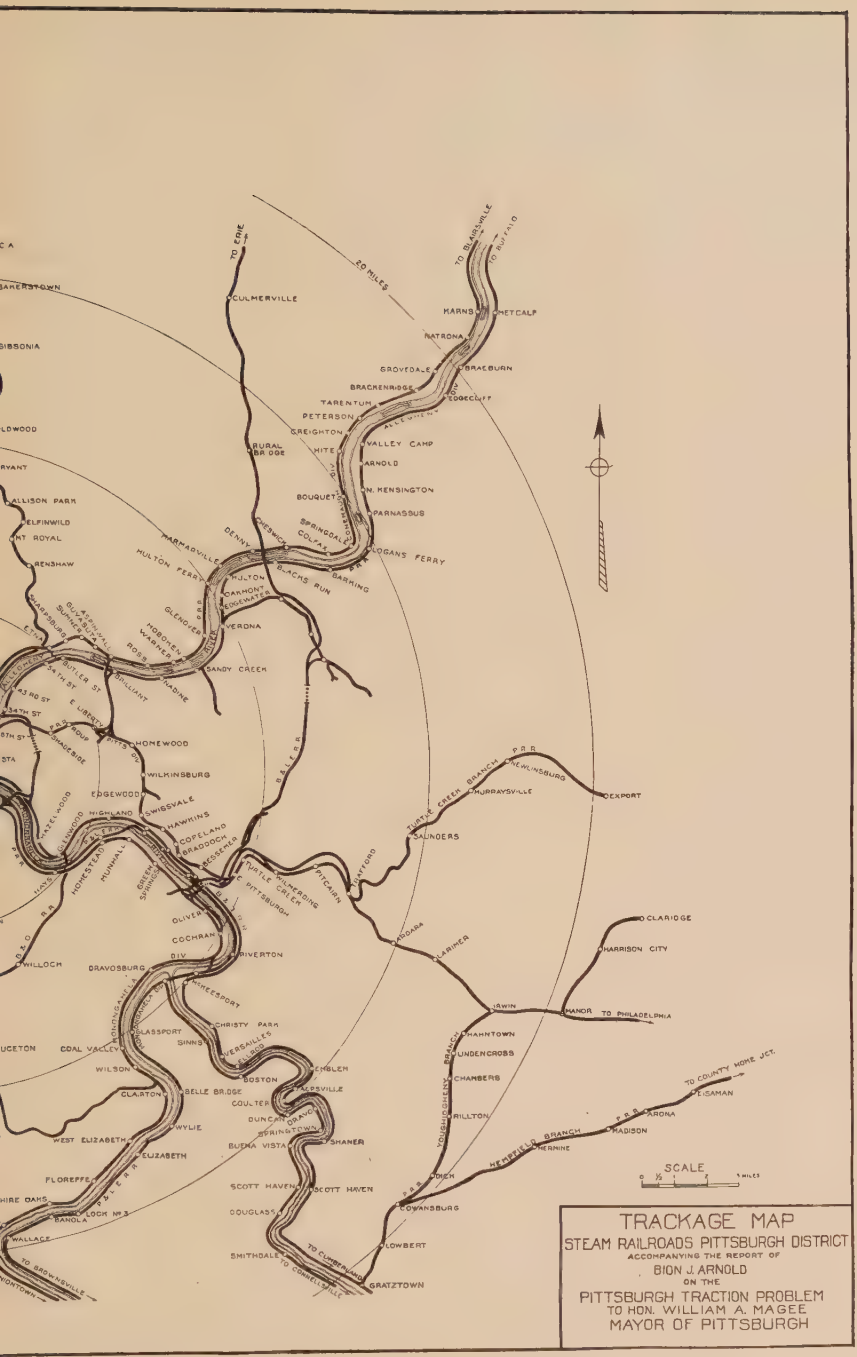
GRAPHICAL RAILROAD TIME TABLE.

In order to study the density of traffic on the suburban branches of the steam roads, the time tables for the summer of 1910 have been plotted as shown by the above example which records the main line train service from Pittsburgh to East Liberty, Wilkinsburg, Braddock and Wilmerding to Trafford. This diagram indicates (a) the time of each train leaving Pittsburgh during one day over the Pittsburgh (local) Division, (b) the relative headway between trains, (c) the length of the suburban section, (d) the time required for a one-way trip (e) the number of trains stopping at each station during the day in both directions, and (f) the scheduled time of each stop. The time table shown above is for the heaviest suburban line in the Pittsburgh District, as high as 54 trains in each direction per day serving this line.



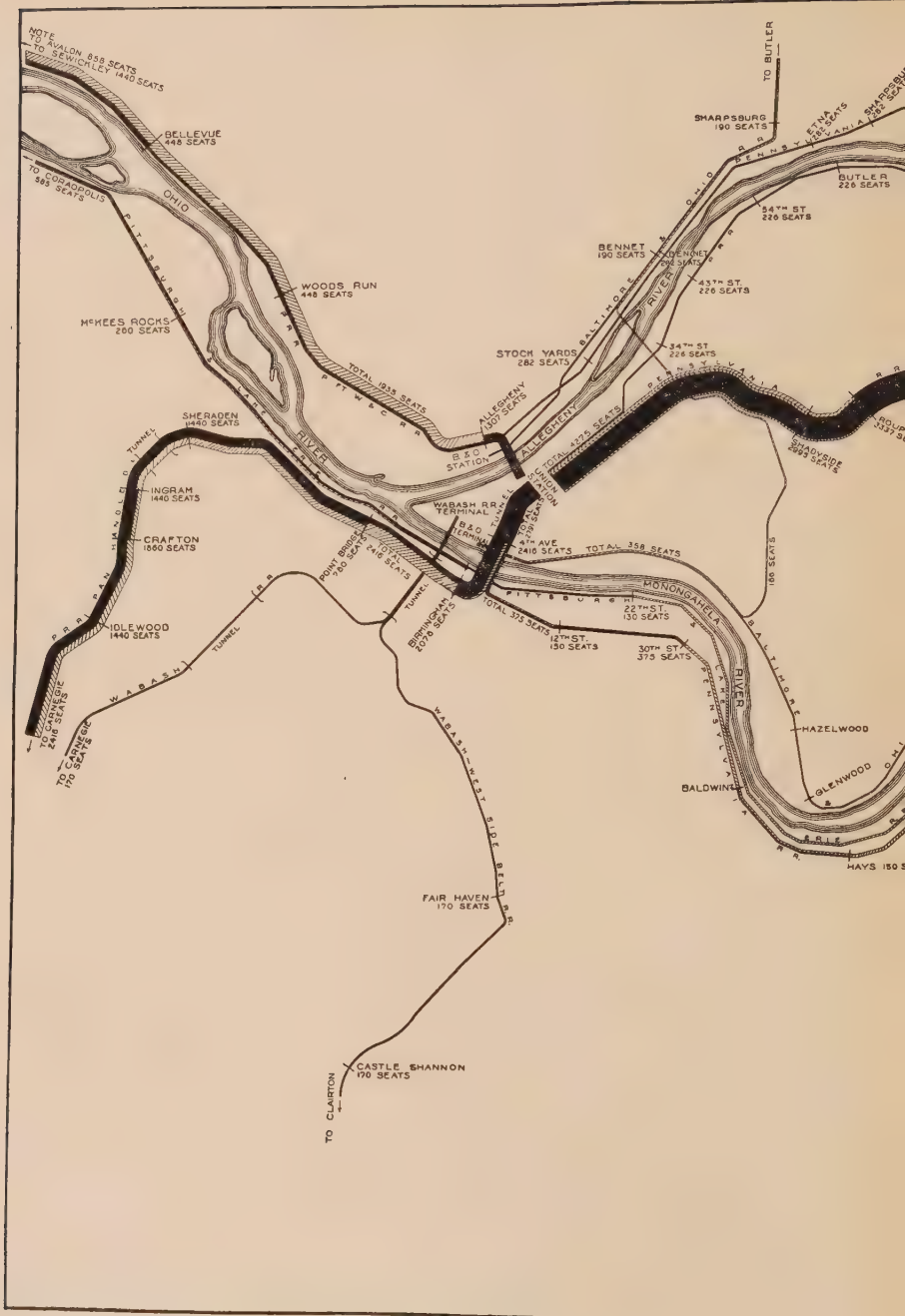
MAP OF STEAM RAILROAD LIN

This diagramatical map of the district around Pittsburgh conveys a clear into Pittsburgh proper. The irregular routes of most of the lines also empha striking feature of this development is the paralleling of all four rivers by rai city, and it is owing to the fact that these bottom lands have long been comp to gain effective entry into Pittsburgh.



E VICINITY OF PITTSBURGH.

of the extent of steam railroad trackage and the limited avenues of entry iculties encountered in meeting the rugged topography of the district. A With one exception, the Wabash, all lines follow the river levels into the npted, that the Wabash line was forced to pierce the South Hills in order



RUSH HOUR SEATING CAPACITY—STEA

The relative widths of the lines indicate the number of seats *sch*
of express service is not available at certain stations, these seats have bee
due to leave the business district during the peak hour is 12323. This
system, and hence shows the relative service provided by the steam and e

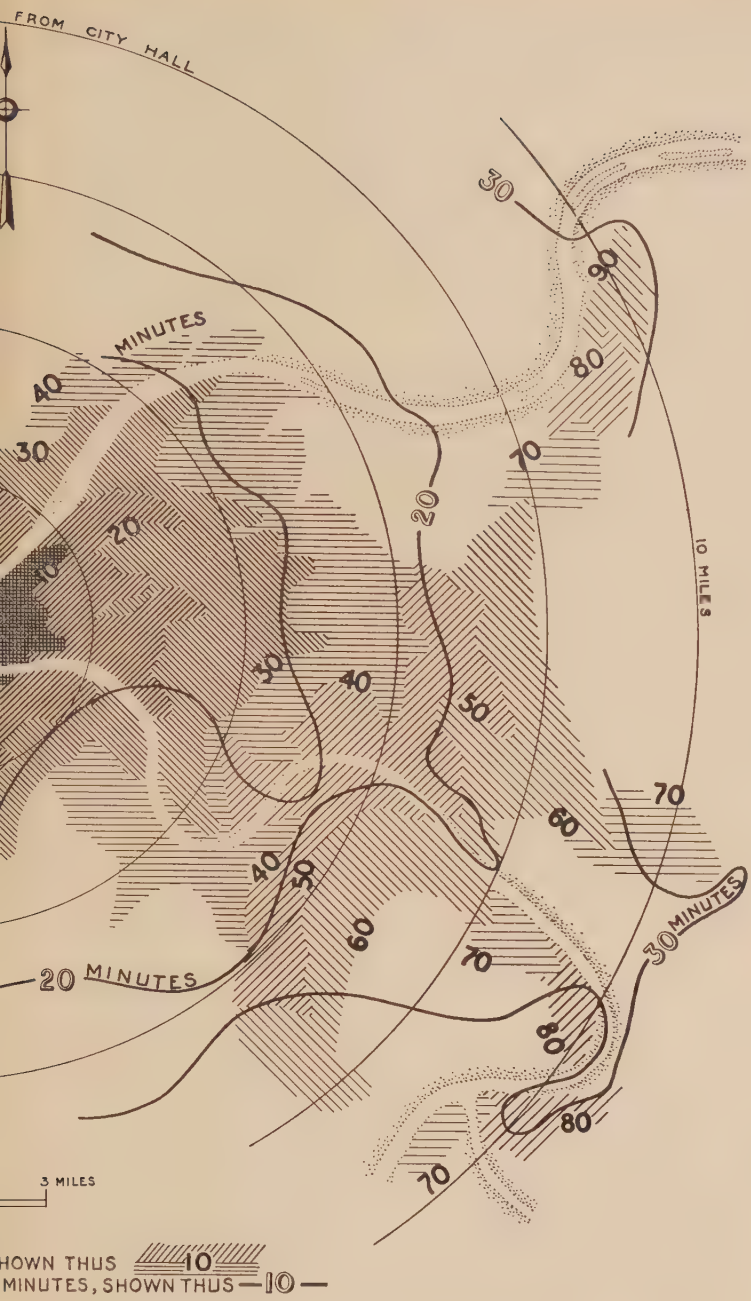
OADS—PITTSBURGH AND VICINITY.

e way on each road during the rush hour. As the seating capacity or distinction from purely local service. The total number of seats vn to the same scale as the Seat Flow Map of the surface railway s.

STREET RAILWAY TIME, IN
STEAM RAILROAD TIME (E

TIME ZONE MAP—SHOWING RELATIVE RUNNING TI

The successive shaded zones indicate the distance the trolley cars travel in te
road suburban express service. To the steam road time must be added the time
point of time is not as great as shown. Eventually, "electrification" will make p
roads, but the speed of the "rapid transit" trains will probably not be much gre
venience, and frequency of the electric trains would greatly increase the present



WEEN TROLLEY SYSTEM AND STEAM RAILROADS.

periods, and the "contour" lines, the corresponding distance for the steam rail-
g to and from the depot at each end so that the advantage of the steam road in
frequent service and a downtown terminal for many of the suburban steam rail-
the present express steam service. However, the greater cleanliness, con-
traffic.

FINANCIAL AND OPERATING RECORDS.

PITTSBURGH RAILWAYS CO.

Presenting complete records of financial results since incorporation —Income Account—Deficit increasing—Monthly variation in earnings, traffic and service -Historical record of track mileage and earnings -Analysis of statistics per car mile, per mile of track, per capita and operating ratio -Average fare -Comparative industrial growth of Pittsburgh District— Traffic distribution and earnings by Districts.

Supplementing previous discussion of Pittsburgh's Immediate Transit Needs, the accompanying record of financial operations of the Pittsburgh Railways Company reviews the principal facts which it was before possible to discuss only in a general way. The analysis of the operating results is purposely comprehensive, in order to meet different points of view. These data necessarily assume the form of extracts from the Company's records, either direct or in indirect graphical form. The graphical method has been used extensively in order to show *relations* as well as absolute quantities. These records are presented largely as *findings of fact,* and hence are simply commented upon where necessary to emphasize essential points. Conclusions to be drawn from these facts will be found elsewhere in the report.

A large part of the information shown by the following tables and diagrams was furnished by the Pittsburgh Railways Company.

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Ratios—Operating Expenses and Bank Clearings to Gross Earnings, Run-off to Revenue Car Miles	108–9
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Comparative Industrial Growth of Pittsburgh District	112
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Map—Annual Earnings by Districts	112–13

INCOME ACCOUNT—PITTSBURGH RAILWAYS COMPANY.
FOR FISCAL YEARS ENDING MARCH 31ST,

	YEAR 1903 DOLLARS	YEAR 1904 DOLLARS	YEAR 1905 DOLLARS	YEAR 1906 DOLLARS	YEAR 1907 DOLLARS	YEAR 1908 DOLLARS	YEAR 1909 DOLLARS	YEAR 1910 DOLLARS
GROSS EARNINGS FROM OPERATIONS.	8,320,285.79	8,699,106.39	8,569,476.96	9,512,615.62	10,232,619.88	10,144,102.92	9,212,935.88	9,922,015.81
OPERATING EXPENSES								
General Expenses	537,534.58	607,735.04	724,815.83	774,108.56	851,908.59	880,202.53	849,864.92	969,676.44
Transportation and Motive Power	2,594,521.21	2,922,431.99	2,767,707.11	2,922,169.76	3,243,327.51	3,574,142.05	3,244,117.80	3,590,857.07
Maintenance of Way and Structures	319,179.36	405,393.48	561,967.59	629,871.35	511,057.46	454,365.30	328,235.98	541,176.08
Park and Duquesne Garden	149,462.22	60,612.35	37,101.04	49,977.10	132,237.96	.....	.....	.....
Maintenance of Equipment	650,315.46	650,166.18	592,561.41	658,901.72	632,981.99	677,697.81	600,006.43	737,749.33
Total Operating Expenses	4,251,012.83	4,646,339.04	4,684,252.98	5,035,028.49	5,371,513.51	5,586,407.69	5,022,225.13	5,839,458.92
Bridge Tolls	114,644.50	118,217.73	113,904.18	128,547.25	108,732.98	116,699.63	108,564.03	109,353.31
Taxes	436,966.11	422,325.11	352,487.53	364,426.35	291,711.11	408,430.99	397,721.77	418,126.88
Total Operating Expenses & Taxes	4,802,623.44	5,186,881.88	5,150,644.69	5,528,002.09	5,771,957.60	6,111,538.31	5,528,510.93	6,366,939.11
NET EARNINGS	3,517,662.35	3,512,224.51	3,418,832.27	3,984,613.53	4,460,662.28	4,032,564.61	3,684,424.95	3,555,076.70
OTHER INCOME								
Rent of Buildings and Real Estate	31,289.65	65,310.60	69,194.03	53,758.46	47,875.88	54,215.58	51,902.77	46,950.82
Interest and Discount	18,989.48	17,437.76	8,075.03	10,774.79	5,013.68	15,222.71	14,123.59	16,534.88
Miscellaneous	24,449.02	17,196.17	18,450.22	20,022.56	31,013.36	13,612.46	17,125.92	15,468.43
Total Other Income	74,728.15	99,944.53	95,719.28	84,555.81	83,902.92	83,050.75	83,152.28	78,954.13
TOTAL INCOME	3,592,390.50	3,612,169.04	3,514,551.55	4,069,169.34	4,544,565.20	4,115,615.36	3,767,577.23	3,634,030.83
DEDUCTIONS FROM INCOME								
Rentals of Leased Property	1,864,872.03	1,997,883.04	2,036,688.45	2,136,306.43	2,178,252.86	2,201,597.33	2,258,011.25	2,278,869.21
Miscellaneous Interest and Discount	61,749.24	150,996.76	168,549.46	205,184.05	278,514.60	365,453.26	343,185.45	435,756.85
Tenement Expenses	2,926.17	14,924.89	8,031.77	8,676.74	2,693.37	3,100.34	2,937.68	4,669.25
Total Deductions from Income	1,929,547.44	2,163,804.69	2,213,269.68	2,350,167.22	2,459,460.83	2,570,150.93	2,604,134.38	2,719,295.31
NET INCOME	1,662,843.06	1,448,364.35	1,301,281.87	1,719,002.12	2,085,104.37	1,545,464.43	1,163,442.85	914,735.52
FIXED CHARGES								
Interest on funded debt of Pittsburg Railways Company and leased Companies	1,380,592.50	1,464,440.84	1,582,833.30	1,676,103.76	1,734,199.71	1,734,687.61	1,792,064.28	1,869,989.90
Surplus or Deficit for Year	282,250.56	†16,076.49	281,551.43	42,898.36	350,904.66	189,223.18	628,621.43	955,254.38
EXTRAORDINARY MAINTENANCE EXPENSES								
Way and Structure	During the years ended March 31st, 1903-1904-1905-1906, extraordinary maintenance expenses were included under operating expenses as maintenance of way and structures and maintenance of equipment.				245,485.41	271,640.00	79,640.66	324,993.36
Equipment					*94,645.85	*60,393.66	*41,000.00	*41,205.39
Total					340,131.26	332,033.66	120,640.66	336,198.75
NET SURPLUS OR DEFICIT FOR YEAR					10,773.40	521,256.84	749,262.09	1,321,453.13

Note—†Deficit shown in Bold Face Type. *Includes $40,000.00 car trust notes.

RECORD OF FINANCIAL RESULTS.

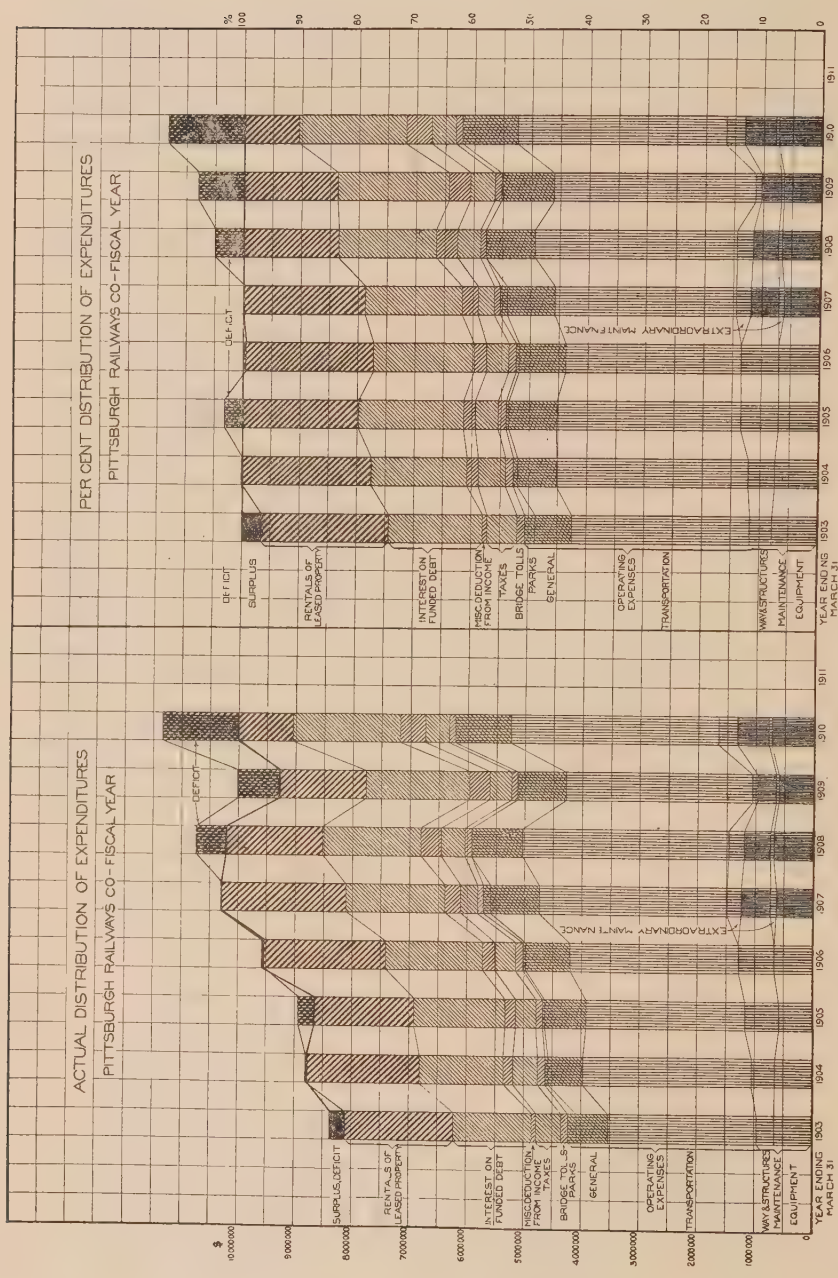
These records give the income and expense accounts of the Pittsburgh Railways Company for the last eight fiscal years, or since the organization of the surface railways into one system.

This information has been plotted graphically and a study of the table and accompanying diagrams will bring out the most important facts in the financial history of the system. The striking fact is that there has been a deficit for the last three fiscal years increasing from $521,256 in 1908 to $1,321,453 in 1910.

In seeking a cause for this deficit the falling off of earnings during the recent financial panic is at once noticeable. In 1906 the earnings increased $943,238 over the previous year, and in 1907 there was another increase of $720,004. If this rate of increase had not been disturbed, it is safe to say there would have been little or no deficit, which during the past three years has accumulated until it now reaches a total of $2,591,972.

A decided effort was apparently made in 1909 to reduce expenses in order to counteract this drop in earnings. In this effort the car service was cut down, the expenditures for maintenance of way and equipment was curtailed to a very low limit and the extraordinary maintenance account, which had been started the previous year, was cut by two-thirds. The result was that, although the earnings fell off $931,167 in the year ending March 31, 1909 as compared with the previous year, the deficit for the year was but $228,005 more than the year ending March 31, 1908.

Apparently it was impossible to keep up these economies and with the recovery of earnings during the past year, the allowances for maintenance and service have increased to nearer the normal requirements.


ACTUAL DISTRIBUTION OF EXPENDITURES
PITTSBURGH RAILWAYS CO - FISCAL YEAR
PER CENT DISTRIBUTION OF EXPENDITURES
PITTSBURGH RAILWAYS CO - FISCAL YEAR
DEFICIT
SURPLUS
RENTALS OF LEASED PROPERTY
INTEREST ON FUNDED DEBT
MISCELLANEOUS DEDUCTIONS FROM INCOME
TAXES
BRIDGE TOLLS
PARKS
GENERAL
OPERATING EXPENSES
TRANSPORTATION
WAYS & STRUCTURES MAINTENANCE
EQUIPMENT
EXTRAORDINARY MAINTENANCE
YEAR ENDING MARCH 31
1903
1904
1905
1906
1907
1908
1909
1910
1911

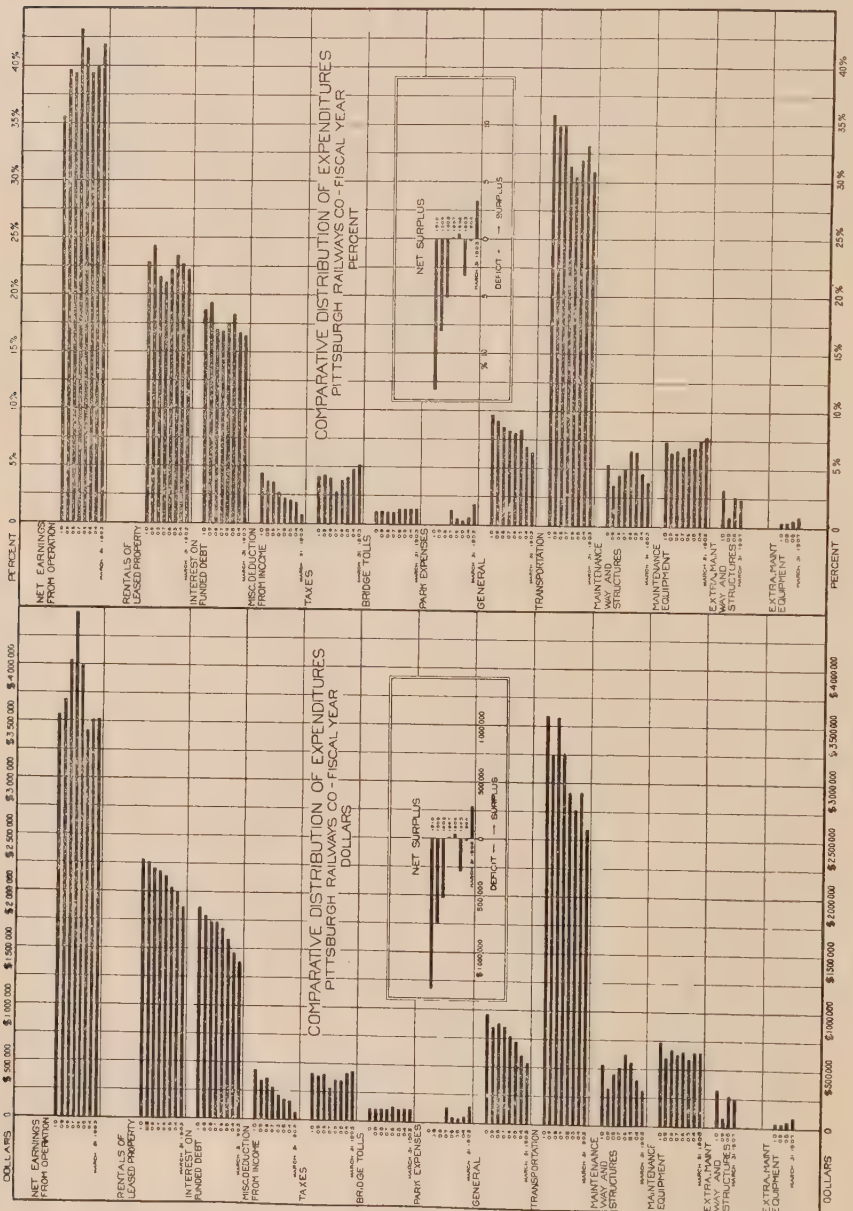
Fiscal year 1910. The result for the last fiscal year ending March 31, 1910 is apparently a fair indication of what may be expected of the present property. These results are briefly recapitulated below. As the income is approximately a multiple of 100, the percentage that each item bears to the total income may be seen at a glance.

The only allowance for renewals shown in the record is for "extraordinary maintenance expenses" reaching a maximum of $336,198 during the last fiscal year, which item includes an annual item for $40,000 for car trust notes.

SUMMARY OF INCOME ACCOUNT—1910.

PITTSBURGH RAILWAYS COMPANY.

INCOME—Year ending March 31, 1910.		
Earnings from operation	$9,922,015.81	
Other income	78,954.13	
Total income		$10,000,969.94
OPERATING EXPENSE.		
Operation	$5,839,458.92	
Bridge tolls	109,353.31	
Taxes	418,126.88	
Total operating expenses and taxes	$6,366,939.11	
Extraordinary maintenance	$ 366,198.75	
Total operation		$6,733,137.86
Net result from operation		$3,267,832.08
DEDUCTIONS.		
Rentals	$2,278,869.21	
Interest on funded debt	1,869,989.90	
	$4,148,859.11	
Miscell. interest and discount	435,756.85	
Tenement expense	4,669.25	$4,589,285.21
DEFICIT		$1,321,453.13


COMPARATIVE DISTRIBUTION OF EXPENDITURES
PITTSBURGH RAILWAYS CO - FISCAL YEAR
DOLLARS
NET SURPLUS
DEFICIT — SURPLUS
COMPARATIVE DISTRIBUTION OF EXPENDITURES
PITTSBURGH RAILWAYS CO - FISCAL YEAR
PERCENT
NET SURPLUS
DEFICIT — SURPLUS
NET EARNINGS FROM OPERATION
RENTALS OF LEASED PROPERTY
INTEREST ON FUNDED DEBT
MISC. DEDUCTION FROM INCOME
TAXES
BRIDGE TOLLS
PARK EXPENSES
GENERAL
TRANSPORTATION
MAINTENANCE WAY AND STRUCTURES
MAINTENANCE EQUIPMENT
EXTRAORDINARY MAINT. WAY AND STRUCTURES
EXTRAORDINARY MAINT. EQUIPMENT
DOLLARS
PERCENT

Distribution of Expenditures.

A study of the percentage diagrams shows that it will be impracticable to reduce the actual operating expenses, (in percent of earnings) below the following amounts which may be considered the minimum.

	Year 1910	Estimated Lowest
Maintenance of equipment	7.37%	7.0%
Maintenance of way	5.41 "	5.0 "
Transportation and power	35.90 "	35.0 "
General expenses	9.69 "	8.0 "
Bridge tolls	1.09 "	1.0 "
	59.46%	56.0%
Taxes	4.18 "	4.0 "
Total	63.64%	60.0%

It will be noted that the above does not include any allowance for depreciation. The only items of this nature in the company's account is the expense for "extraordinary maintenance" which never has amounted to 4% of earnings.

This study, therefore, indicates that the deficit cannot be avoided by economy in operating expenses, and this fact focuses attention on the annual fixed charges, viz.:

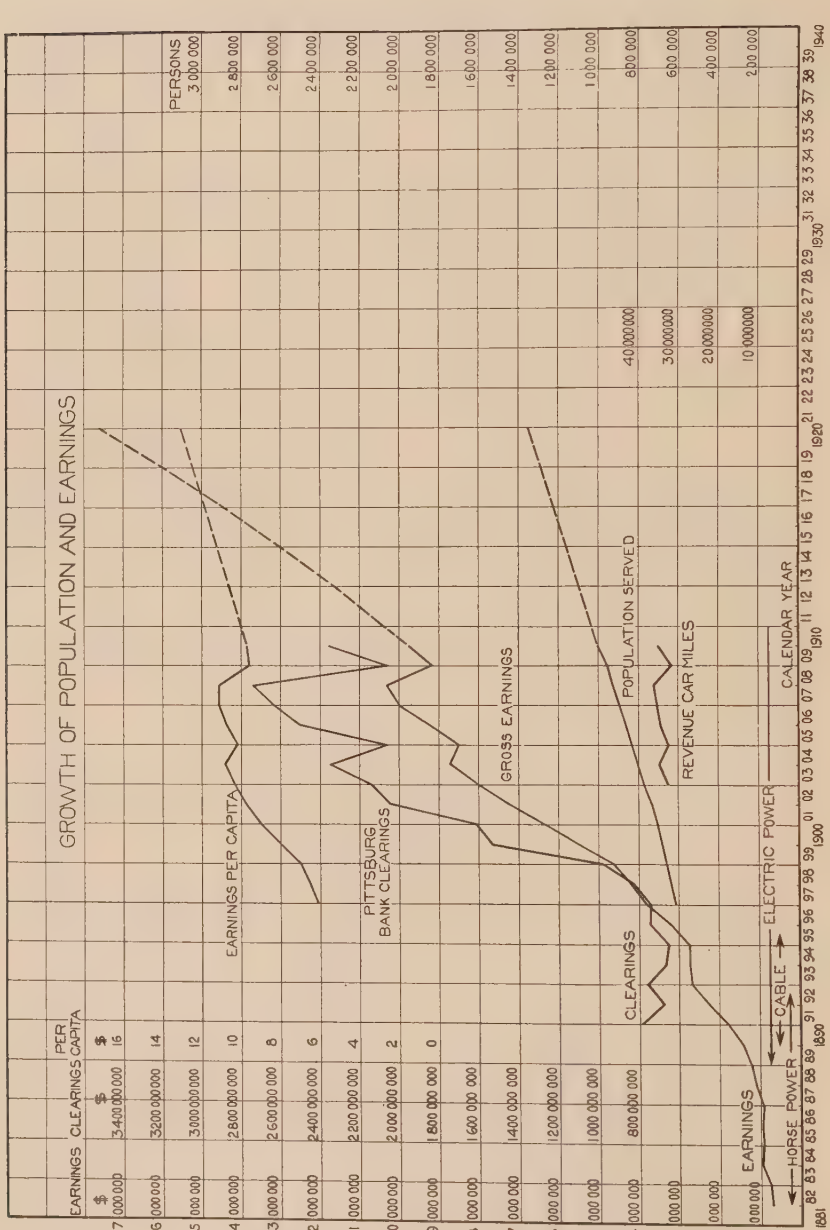
Rentals of leased property.

Interest on funded debt of Pittsburgh Railways Company and leased companies.

Miscellaneous interest and discount.

These three items have been constantly increasing in amount since the organization of the company until last year when they amounted to over 45% of the income.

If the total operating expense cannot be reduced to less than 60% of the earnings and if depreciation requires an allowance equal to 10%, making a total of 70%, only 30% of the earnings will be available for fixed charges. If these charges amount to 45% instead of 30%, there must be an annual deficit equal to 15% of the earnings anticipated. On the other hand, if this is to be avoided, the *fixed charges must be reduced by one-third* on the basis of the present earnings, or else *the earnings must increase by 50%, i. e. to about $15,000,000 per year before the present fixed charges can be equitably earned without a deficit.*


GROWTH OF POPULATION AND EARNINGS
EARNINGS
CLEARINGS
PER CAPITA
$
$
EARNINGS PER CAPITA
PITTSBURG BANK CLEARINGS
GROSS EARNINGS
POPULATION SERVED
REVENUE CAR MILES
CLEARINGS
EARNINGS
PERSONS
HORSE POWER
CABLE
ELECTRIC POWER
CALENDAR YEAR

RECORD OF YEARLY EARNINGS.

The opposite diagram records the annual earnings since 1881 of all companies comprising the present Pittsburgh Railways system, following in succession the various extensions of system and changes in motive power. The droops in the earnings curve indicate the results of financial stringencies in 1893, 1904 and 1908. In 1893-4 earnings fell approximately $900,000 below what they would have been, based on previous increase. In 1904 the earnings were affected $800,000 and in 1908 nearly $2,000,000 by the panic of that year. That these declines are directly traceable to financial conditions of the District is clearly evident by comparison with Pittsburgh bank clearings where the same droops are in evidence. The net result of the two panics is that the earnings of last year were $3,000,000 less than might have been expected by estimating upon a rate of growth prevailing at the time the present system was organized. At that time (1902) the earnings were increasing at a greater rate than during any subsequent period.

Population. The curve of population covers the entire traction district served by the present company and indicates a present population of over 1,000,000 people. In interurban territory, tributary population has been considered as lying within a strip 1½ miles on either side of the railway company's line.

In times of normal business prosperity, earnings per capita should grow directly as the population. The record for Pittsburgh indicates that at times, the growth has been at a much faster rate.

Car miles. The small depression in the curve of revenue car miles occurs in 1904 and 1908, as in the case of earnings, showing that with the decrease in revenue, the service rendered was also decreased.

MONTHLY GROSS EARNINGS FROM OPERATION.

PITTSBURG RAILWAYS COMPANY.

	1902	1903	1904	1905	1906	1907	1908	1909	1910
January	$ 592,162	$ 659,160	$ 634,468	$ 659,603	$ 774,761	$ 806,800	$ 746,954	$ 741,750	$ 796,242
February	526,627	596,140	602,998	609,955	690,433	731,775	678,926	682,658	718,239
March	609,293	685,515	676,230	704,527	761,197	805,071	733,054	762,266	851,806
April	617,177	693,501	688,568	723,627	803,079	833,703	737,991	773,075	.....
May	722,615	785,312	763,281	809,714	891,932	926,197	797,064	851,826	.....
June	709,145	766,438	763,608	819,284	891,242	933,996	807,762	798,785	.....
First Six Months	3,777,026	4,186,071	4,129,160	4,326,715	4,812,644	5,037,545	4,501,755	4,610,364	.....
July	772,648	807,012	790,217	852,680	907,893	949,963	800,156	873,867	.....
August	729,420	791,678	736,618	829,224	877,573	907,063	779,512	846,880	.....
September	707,273	777,010	732,044	842,909	881,469	890,216	771,417	843,876	.....
October	713,153	785,606	735,720	821,346	865,302	892,706	814,985	882,119	.....
November	678,384	697,811	687,099	774,524	818,060	827,499	735,881	834,202	.....
December	691,403	699,837	721,301	808,430	845,388	823,321	782,908	851,092	
Second Six Months	4,292,287	4,558,960	4,403,006	4,929,117	5,195,685	5,290,770	4,684,860	5,132,039	.....
Total for Year	8,069,312	8,745,032	8,532,165	9,255,832	10,008,329		See Note Below.		
Total less Parks	8,005,750	8,717,150	8,507,352	9,255,832	10,008,329	10,328,315	9,186,616	9,742,403	.....

Note.—Data includes earnings of all Inclines and Pittsburg and Castle Shannon Railroad.

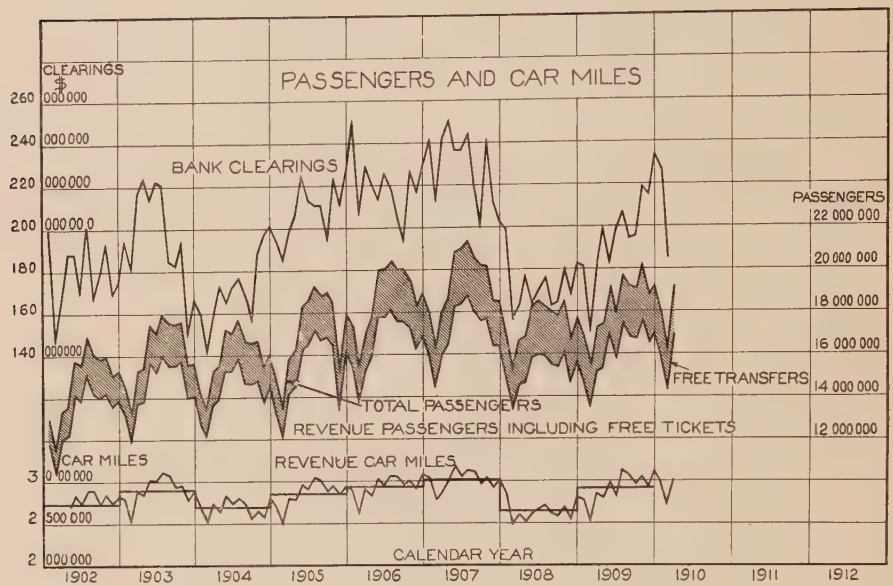
For purposes of comparison park receipts have been deducted—in total for years 1902, 1903 and 1904. From 1905-1909 inclusive, deducted month by month. Cents columns omitted, totals correct.

REVENUE PASSENGERS CARRIED BY MONTHS

PITTSBURG RAILWAYS COMPANY.

	1902	1903	1904	1905	1906	1907	1908	1909	1910
January	11,812,499	13,189,609	12,789,476	13 291,835	15,529,201	15,987,628	14,907,875	14,747,501	15,786,890
Feoruary	10,407,270	11,948,769	12,162,838	12,183,733	13,831,443	14,515,837	13,515,390	13,564,149	14,271,869
March	12,044,178	13,741,248	13,645,675	14,182,372	15,274,812	16,000,190	14,615,751	15,173,827	16,963,849
April	12,265,738	13,866,887	13,888,432	14,583,318	15,958,894	16,507,251	14,705,800	15,378,212	.....
May	14,198,666	15,638,956	15,281,457	16,290,439	17,828,859	18,346,688	15,916,749	16,927,292	.....
June	13,893,630	15,237,158	15,274,067	16,542,804	17,811,836	18,393,588	15,985,133	15,784,092	.....
First Six Months	74,621,981	83,622,627	83,041,945	87,074,501	96,235,045	99,751,182	89,646,698	91.575,073	.....
July	15,133,152	16,032,572	15,815,704	17,195,626	18,199,833	18,807,520	15,946,782	17,438,529	.....
August	14,284,018	15,551,465	14,773,801	16,742,015	17,602,321	17,979,846	15,519,543	16,854,521	.....
September	14,002,248	15,557,651	14,683,267	16,879,910	17,646,468	17,624,553	15,424,102	16.791,650	.....
October	14,271,524	15,776,894	14,826,283	16,460,058	17,290,900	17,725,499	16,145,151	17,588,721	.....
November	13,600,321	14,020,454	13,827,851	15,522,520	16,321,160	16,429,131	14,644,255	16,559,249	.....
December	13,878,523	14,119,829	14,533,823	16,232,189	16,944,346	16,423,030	15,629,888	16,943,938	.....
Second Six Months	85,169,786	91,058,865	88,460,729	99,032,318	104,005,028	104,989,579	93,309,721	102,176,608	.....
Total Year	159,791,767	174,681,492	171,502,674	186,106,819	200,240,073	204,740 761	182,956,419	193,751,681	.....
Free Transfers	18,910,803	20,542,668	21,653,434	22,238,230	25,494,407	27,675,854	26,759,344	26,629.619	.....
Total Rides	178,702,570	195,224,160	193,156,108	208,345,049	225,734,480	232,416,715	209,715.763	220,381,300	.....

Note.—Free Tickets included in revenue passengers.
Data excludes passengers carried on Inclines and Pittsburg & Castle Shannon Railroad (except after July, 1909, electrification.)
Cash fares larger than 5 cents pro rated as excess passengers on a basis of 5 cents.



REVENUE CAR MILES OPERATED BY MONTHS.

PITTSBURGH RAILWAYS COMPANY.

	1902	1903	1904	1905
January	2,651,545	2,800,429	2,686,135	2,704,560
February	2,403,199	2,524,519	2,528,295	2,509,413
March	2,616,395	2,891,114	2,751,240	2,807,575
April	2,656,767	2,842,471	2,660,063	2,778,804
May	2,829,385	3,035,696	2,832,599	2,961,672
June	2,737,626	3,027,835	2,741,926	2,915,773
First Six Months	15,894,917	17,122,064	16,200,258	16,677,797
July	2,902,133	3,122,372	2,814,416	3,064,086
August	2,913,592	3,090,298	2,744,668	3,032,897
September	2,743,714	2,942,642	2,578,104	2,885,969
October	2,854,223	2,962,473	2,649,774	2,961,542
November	2,751,014	2,788,121	2,585,119	2,845,455
December	2,835,742	2,889,358	2,819,720	2,939,783
Second Six Months	17,000,418	17,795,264	16,191,801	17,729,732
Total Year	32,895,335	34,917,328	32,392,059	34,407,429

	1906	1907	1908	1909	1910
January	2,907,444	3,061,395	2,855 657	2,780,823	2,993,734
February	2,619,888	2,784,469	2,505,290	2,544.408	2,718,729
March	2,907,684	2,875,937	2,612,776	2,865,749	3,088,638
April	2,821,393	3,021,995	2,525,437	2,810,528	.....
May	3,021,996	3,187,253	2,633.832	2,990,955	.....
June	2,965,532	3,055,171	2,669,101	2,804,714	.....
First Six Months	17,243,937	17,986,220	15,802,093	16,797,177	.....
July	3,073,574	3,138,771	2,714,919	3,136,159	.....
August	3,067,321	3,119,724	2,626,504	3,085,923	.....
September	2,967,799	2,956,004	2,582,412	2,963,275	.....
October	3,011,777	3,055,693	2,706.179	3,063.139	.....
November	2,908.710	2,915,592	2,547,218	2,930.377	.....
December	3,078,098	3,020,469	2,811,020	3,104,130	.....
Second Six Months	18,107,279	18,206 253	15,988,252	18,283,003	.....
Total Year	35,351,216	36,192,473	31,790,345	35,080,180	.....

Note.—Data includes run off mileage and special car revenue mileage from May, 1904.
Does not include mileage of Inclines or of Pittsburg and Castle Shannon Railroad (except after July 1909—electrification.)

MONTHLY TRAFFIC RECORD.

The record on the opposite page shows the varying riding habit of the passengers from season to season. It will be noted there are considerably more passengers carried in the summer than in the winter months, February being the lowest of the year, both on account of season and its being the shortest month. In general July shows the largest traffic. Outside the monthly changes, a gradual increase in traffic is recorded from 1902 to 1907, with the exception of a slight drop in 1904. The depression of 1908 shows very plainly the effect of the panic commencing October, 1907. Since then a gradual improvement is recorded, and the first few months of 1910 would indicate that in this respect, the number of passengers carried will exceed the record of the banner year, 1907. The record of revenue passengers includes the users of free tickets; but as free tickets are issued to employees of the company only, their effect is inappreciable.

Transfers. The shaded section lying above the curve of revenue passengers indicates the number of free transfers used. These varied from 10% to 13% in excess of revenue passengers, during the first year, 1902, or 13% to 16% during 1908, the greater percentage occurring during the summer months.

Bank clearings for comparison are plotted here by months. It will be noted that the fluctuations in clearings are closely reflected in the monthly passenger business of the Railways Company. It is also interesting to note that the bank clearings for the present year are again on the increase.

Revenue car miles vary with the season somewhat similarly to passengers. The record shows that an effort is made to vary the car miles to suit passenger traffic both by seasons and by years. Again the depression of 1908 is conspicuous, and to a lesser degree in 1904. Note that the number of car miles furnished during 1908 was less than any previous year shown.* The years of 1903 and 1904 were practically equal in passengers carried, but car miles averaged about 2,000,000 less in 1904, showing the effect of the policy of retrenchment prevailing. Again, the revenue passengers carried in 1908 was 14,500,000 in excess of 1903, but the car miles in 1908 totaled about 3,250,000 less. That considerable improvement was made in the car service in 1909 is evidenced by the rising curve, and for the first few months of 1910, the car miles furnished have been greater than during any corresponding period in the company's history.

*The company reports that the cars withdrawn from service during this year were mostly small cars which were to a certain extent replaced by larger cars; consequently the retrenchment in service if measured in seat miles would not be as great as indicated by this record of car miles.

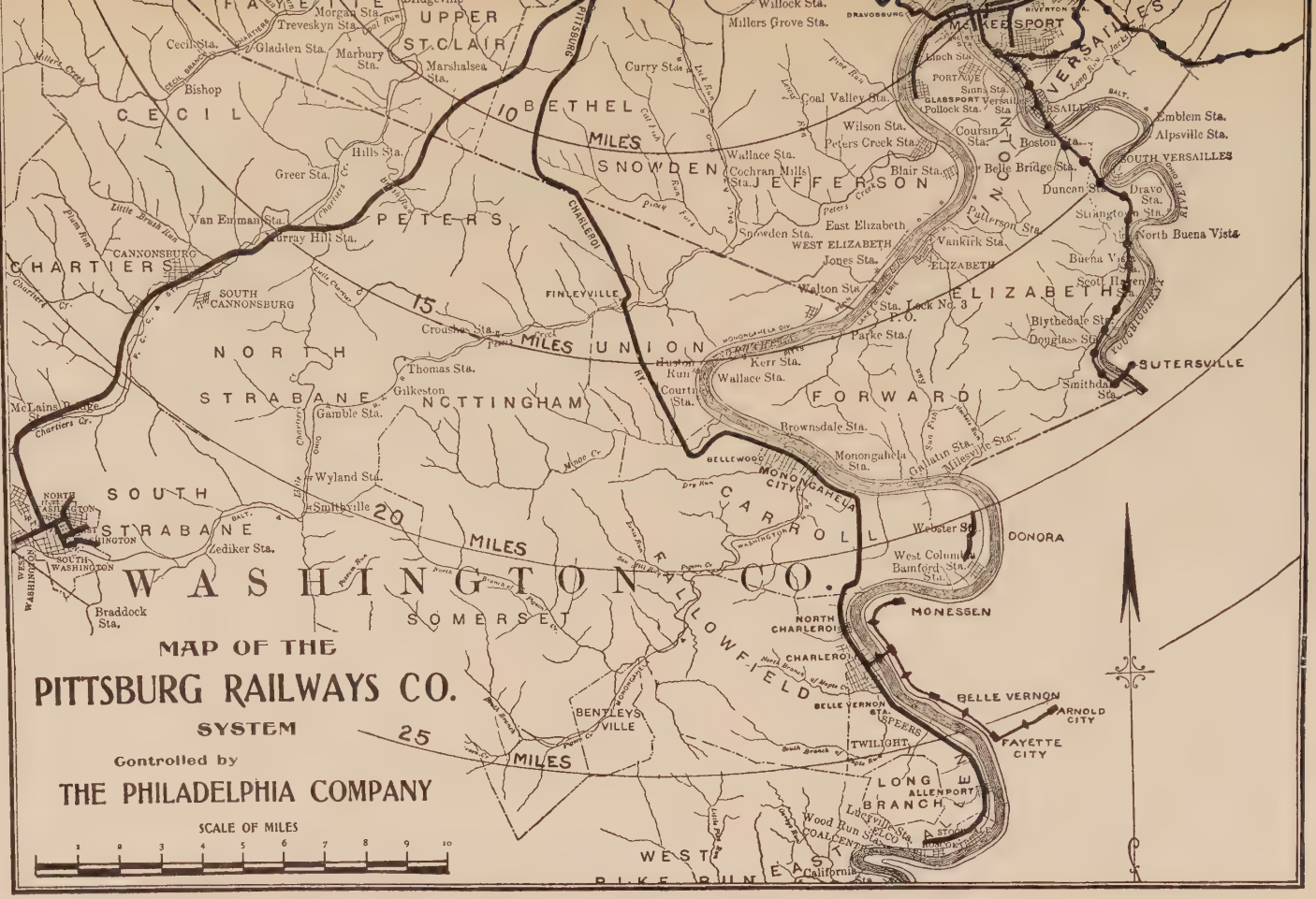
STATEMENT OF TRACK MILEAGE AND GROSS EARNINGS
FROM ANNUAL REPORT OF SECRETARY OF INTERNAL AFFAIRS.

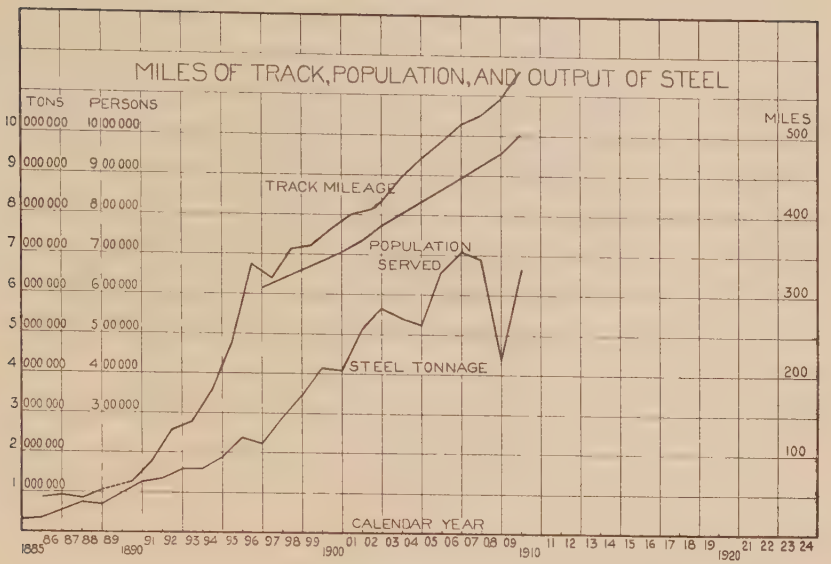
REPORTED AS OF DECEMBER 31ST, UP TO 1888 INCLUSIVE, AS OF JUNE 30TH, FROM 1890 TO 1909.

PITTSBURGH RAILWAYS SYSTEM

YEAR	MILES OF TRACK				TOTAL MILES TRACK	TOTAL GROSS EARNINGS
	CONSOLIDATED TRACTION COMPANY	UNITED TRACTION COMPANY	SOUTHERN TRACTION COMPANY	PITTSBURG & CASTLE SHANNON RAILROAD		
1881	----------	----------	----------	------	----------	$ 683,279
1882	----------	----------	----------	------	----------	746,076
1883	----------	----------	----------	------	----------	966,445
1884	----------	----------	----------	------	----------	925,920
1885	18.36	20.79	3.50	------	42.65	948,240
1886	19.86	22.24	3.50	------	45.60	911,622
1887	13.25	24.76	5.25	------	43.26	1,108,875
1888	13.25	28.76	5.25	6.5	53.76	1,230,101
1889	----------	----------	----------	------	----------	----------
1890	12.21	39.47	5.25	6.5	63.43	1,570,214
1891	19.11	58.90	5.25	6.5	89.76	2,034,809
1892	45.40	70.86	5.25	6.5	128.01	2,515,848
1893	43.40	76.34	12.90	6.5	139.14	2,861,535
1894	73.98	73.05	24.44	6.5	177.97	2,681,319
1895	92.24	115.91	24.44	6.5	239.09	2,869,000
1896	156.14	128.98	45.69	6.5	337.31	3,591,343
1897	139.00	130.81	43.44	6.5	319.75	4,016,437
1898	154.64	149.24	45.44	6.5	355.82	4,351,424
1899	160.43	149.24	45.44	6.5	361.61	4,971,745
1900	170.57	155.10	50.19	6.5	382.36	6,008,357
1901	187.02	157.84	48.80	6.5	400.16	6,758,724
1902	----------	----------	----------	6.5	407.18	7,713,165
1903	----------	----------	----------	6.5	415.61	8,441,864
1904	----------	----------	----------	6.5	446.59	8,789,598
1905	----------	----------	----------	6.5	470.79	8,785,492
1906	----------	----------	----------	------	491.85	9,736,553
1907	----------	----------	----------	------	513.53	10,298,032
1908	----------	----------	----------	------	525.42	9,792,526
1909	----------	----------	----------	------	545.92	9,258,083
1910	----------	----------	----------	------	581.00	----------

LEGEND
PITTSBURGH RAILWAYS COMPANY
ALLEGHENY VALLEY STREET RAILWAY CO.
PITTSBURGH & BUTLER STREET RAILWAY CO.
PITTSBURGH, HARMONY, BUTLER & NEW CASTLE RY.
WEST PENN RAILWAYS
OAKDALE & McDONALD STREET RAILWAY CO.
BEAVER VALLEY TRACTION CO.
WEBSTER, MONESSEN, BELLE VERNON & FAYETTE CITY STREET RAILWAY CO.
PINE
RICHLAND
WEST DEER
EAST DEER
FAWN
FRANKLIN
SEWICKLEY
McCANDLESS
HAMPTON
INDIANA
HARMAR
SPRINGDALE
ARNOLD
NEW KENSINGTON
PARNASSUS
CRESCENT
OHIO
ALLEGHENY
ROSS
SHALER
O'HARA
ASPINWALL
SHARPSBURG
ETNA
MILLVALE
ALLEGHENY RESERVE
ALLEGHENY
MONONGAHELA
PENN
PLUM
MOON
CORAOPOLIS
ROBINSON
NORTH FAYETTE
COLLIER
CARNEGIE
CHARTIERS
MCKEES ROCKS
STOWE
WILKINSBURG
EDGEWOOD
WILKINS
PATTON
STRABANE
UNION
JEFFERSON
BRADDOCK
TURTLE CREEK
WILMERDING
PITCAIRN
TRAFFORD CITY
Anderson Road Sta.
Shields Sta.
Edgeworth Sta.
Sewickley
Quaker Valley Sta.
Osborne
Stoops Ferry Sta.
Thorn Run Sta.
Sewickley Bridge
Emsworth
Ben Avon
Avalon
Groveton Sta.
Coke Works Sta.
Ewing Sta.
Ross Sta.
Guys Mill Sta.
McCloskey Sta.
Wilson Sta.
Enlow Sta.
Scott Sta.
Stewart Sta.
Montour Run
Moon Run
Fleming Park Sta.
McKees Rocks
Sheridan
Chartiers
Craighton
Ingram
Idlewood Sta.
Lockton Sta.
Cregg Sta.
Oakdale
Mffley Sta.
Beachmont
Hickman Sta.
Gleens Sta.
Leasdale Sta.
McDonald
Fin Run
Bryant Sta.
Allison Sta.
Finnwild Sta.
Burchfield Sta.
Coal Dale Sta.
Willmer Sta.
Underclift Sta.
Etna
Pine Ck. Sta.
Millvale
Duquesne Park
Spring Garden
Allegheny Cemetery
Sharpsburg
Aspinwall
Power Run Sta.
Verona Sta.
Montana Sta.
Hutton Ferry Sta.
Fulton Sta.
Edgewater Sta.
Oakmont
Verona
Springdale
Denny
Hires Sta.
Peterson Sta.
Tarentum
Brackenridge Sta.
Bouquet Sta.
Logans Ferry Sta.
Elk Falling Sta.
Morath Sta.
Milltowa Sta.
Campbell Sta.
Creek Sta.
North Bessemer Sta.
Coal Works Sta.
Bessemer
Wildwood Sta.
Coleman Sta.
Edgewood Park
Swissvale
Braddock Ave.
Braddock Hills
Regent Square
Wilkinsburg
Edgewood
St. Barrett
Schenley Park
Penn Place
Swissvale
Penn
Turtle Creek
Braddock
Homestead
Lucas Sta.
Hayes Sta.
Dalzell Sta.
Oak St.
Mt. Lebanon
Green Tree
Lowe St. Clair
Dawson St.
Smithfield St.
Fort Pitt Bridge
Fort Pitt Tunnel
Point Bridge
Fort Duquesne Bridge
Fort Wayne Bridge
Liberty Bridge
Smithfield St. Bridge
Manchester
Fairhaven Sta.
Kenney St.
Thomson St.
Point Ferry Sta.
East McKeesport
North Versailles
Blackburn Sta.
Pine Creek
Deer Creek
Little Deer Creek
Girtys Run
Bull Creek
Plum Creek
Little Plum Creek
Big Puckett Creek
Turtle Creek
Brush Creek
Chartiers Creek
Montour Run
Moon Run
Robinson Run
Flaugherty Run
Little Sewickley Creek
Big Sewickley Creek
Thorn Run
Potter Run
Dickson Run
Blue Run
Deer Lake
Lake Elizabeth
Lake Tarentum
Allegheny River
Ohio River
Monongahela River


MAP OF THE
PITTSBURG RAILWAYS CO.
SYSTEM
Controlled by
THE PHILADELPHIA COMPANY
SCALE OF MILES
1 2 3 4 5 6 7 8 9 10
WASHINGTON CO.
10 MILES
15 MILES
20 MILES
25 MILES
CECIL
PETERS
CHARTIERS
NORTH STRABANE
SOUTH STRABANE
SNOWDEN
BETHEL
UPPER ST. CLAIR
JEFFERSON
UNION
NOTTINGHAM
FINLEYVILLE
CANNONSBURG
SOUTH CANNONSBURG
McMURRAY
SOUTH VERSAILLES
ELIZABETH
FORWARD
CARROLL
DONORA
MONESSEN
BELLE VERNON
FAYETTE CITY
ARNOLD CITY
CHARLEROI
NORTH CHARLEROI
MONONGAHELA CITY
BELLEVUE
ALLOWFIELD
BENTLEYSVILLE
TWILIGHT
LONG BRANCH
ALLENPORT
WEST BRANCH
SUTERSVILLE
NORTH BUENA VISTA
Bishop
Cecil Sta.
Gladden Sta.
Morgan Sta.
Treveskyn Sta.
Marbury Sta.
Marshalsea Sta.
Curry Sta.
Millers Grove Sta.
Willock Sta.
Coal Valley Sta.
Wilson Sta.
Peters Creek Sta.
Wallace Sta.
Cochran Mills Sta.
Blair Sta.
Belle Bridge Sta.
Duncan Sta.
Dravo Sta.
Emblem Sta.
Alpsville Sta.
Boston Sta.
Coursin Sta.
Pollock Sta.
Versailles Sta.
Linch Sta.
Sans Sta.
Hills Sta.
Greer Sta.
Van Emman Sta.
Murray Hill Sta.
Snowden Sta.
East Elizabeth
WEST ELIZABETH
Jones Sta.
Vankirk Sta.
Fullerton Sta.
Walton Sta.
Sta. Lock No. 3
P.O.
Parke Sta.
Buena Vista Sta.
Scott Haven
Blythedale Sta.
Douglass Sta.
Smithdale Sta.
Crouse Sta.
Thomas Sta.
Gilkeston
Gamble Sta.
Kerr Sta.
Wallace Sta.
Huston Run
Court Sta.
Brownsdale Sta.
Monongahela Sta.
Gallatin Sta.
Allenville Sta.
Webster Sta.
West Columbia
Bamford Sta.
Wyland Sta.
Smithfield
Zediker Sta.
Braddock Sta.
SOMERSET
Millers Creek
Little Brush Run
Plum Run
Chartiers Cr.
Pigeon Run
Pinkerton Run
Peters Creek
Lick Run
Pigeon Cr.
Drake Run
Minor Cr.
Dry Run
Turkey Foot Run
Pike Run
Maple Cr.
Speers
Lucyville Sta.
Wood Run
COALCENTER
California
Stockdale
Allenport
Versailles
Riverton
Jacktown
Long Run
Pinkerton Run
Peters Creek
Pinkerton



RECORD OF TRACK MILEAGE.

From reports to the State Secretary of Internal Affairs.

This curve shows the total single track mileage of all companies operating in the Pittsburgh District and which now constitute the system of the Pittsburgh Railways Company. It indicates nearly continuous growth from about 43 miles in 1886 to 581 miles in 1910.

During the period of most rapid extension of the trackage, 1890 to 1896, the system increased from 63 miles to 337 miles, or at an average rate of 55 miles per year. The record was nearly 100 miles per year in 1895-6. Since 1897, track extensions have been maintained at an average rate of 20 miles per year, in fact the lines of the Pittsburgh Railways Company have been extending at a slightly greater rate than the population.

In the table the subdivided mileage is shown for the three principal underlying companies —The United Traction Company, the Consolidated Traction Company and the Southern Traction Company.

GROSS EARNINGS PER REVENUE CAR MILE BY MONTHS.

PITTSBURGH RAILWAYS COMPANY.

	1902 CENTS	1903 CENTS	1904 CENTS	1905 CENTS	1906 CENTS	1907 CENTS	1908 CENTS	1909 CENTS	1910 CENTS
January	22.08	23.29	23.40	24.13	26.25	25.97	25.81	26.31	26.59
February	21.65	23.36	23.63	24.08	25.95	25.88	26.71	26.48	26.44
March	23.01	23.48	24.38	24.86	25.78	27.57	27.65	26.24	27.58
April	22.97	24.15	25.66	25.82	28.01	27.17	28.82	27.12	.....
May	25.27	25.62	26.71	27.10	29.08	28.65	29.84	28.10	.....
June	25.65	25.08	27.60	27.91	29.60	30.16	29.85	28.07	.....
First Six months.	23.50	24.21	25.26	25.71	27.49	27.60	28.09	27.07	.....
July	26.39	25.62	27.83	27.61	29.10	29.84	29.06	27.48	.....
August	24.79	25.41	26.60	27.11	28.17	28.65	29.26	27.16	.....
September	25.52	26.19	28.11	28.75	29.26	29.67	29.45	28.16	.....
October	24.72	26.28	27.49	27.30	28.26	28.75	29.65	28.47	.....
November	24.41	24.81	26.29	26.79	27.66	27.97	28.48	28.12	.....
December	24.13	24.00	25.34	27.11	27.04	26.88	27.49	27.10	.....
Second Six months.	25.00	25.40	26.93	27.44	28.25	28.63	28.89	27.74	.....
Total including parks.	24.27	24.81	26.10	.....	See Note Below	.....			
Total less parks	24.08	24.73	26.02	26.60	27.88	28.12	28.49	27.42	.....

NOTE—Park receipts have been deducted monthly except in 1902, 1903 and 1904 when they were deducted in total at end of year.

TOTAL PASSENGERS PER REVENUE CAR MILE BY MONTHS.

PITTSBURGH RAILWAYS COMPANY

	1902	1903	1904	1905	1906	1907	1908	1909	1910
January	4.93	5.22	5.32	5.47	5.97	5.88	5.92	6.06	5.98
February	4.81	5.24	5.36	5.41	5.90	5.87	6.13	6.07	5.96
March	5.12	5.28	5.56	5.64	5.87	6.27	6.38	6.04	6.22
April	5.13	5.43	5.84	5.87	6.34	6.17	6.66	6.22	....
May	5.57	5.76	6.08	6.17	6.67	6.54	6.96	6.42	....
June	5.70	5.64	6.27	6.38	6.78	6.87	6.93	6.40	....
July	5.83	5.76	6.32	6.29	6.68	6.83	6.77	6.28	....
August	5.53	5.69	6.12	6.23	6.54	6.62	6.87	6.24	....
September	5.78	5.95	6.45	6.58	6.78	6.82	6.91	6.46	....
October	5.59	5.94	6.28	6.23	6.49	6.60	6.85	6.57	....
November	5.48	5.58	5.98	5.38	6.30	6.38	6.58	6.43	....
December	5.39	5.42	5.72	6.13	6.17	6.14	6.32	6.17	....
Average, Year	5.43	5.59	5.97	6.06	6.38	6.43	6.60	6.28	....

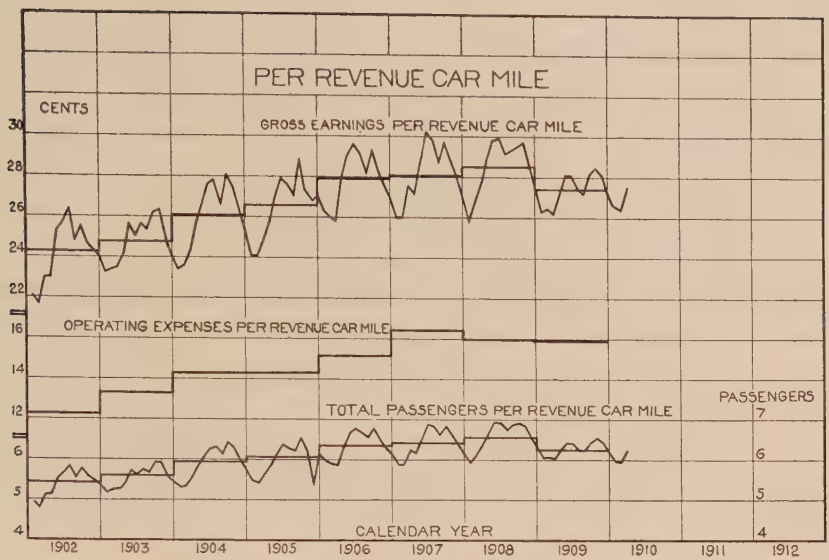
OPERATING EXPENSES PER REVENUE CAR MILE.

PITTSBURGH RAILWAYS COMPANY

CALENDAR YEAR	CENTS	CALENDAR YEAR	CENTS
1902	12.21	1906	15.17
1903	13.33	1907	14.46
1904	14.32	1908	15.99
1905	14.33	1909	15.91

Excludes Parks and Inclines.

Includes Operating Expenses and dead mileage of non-revenue cars.



OPERATING RESULTS PER REVENUE CAR MILE.

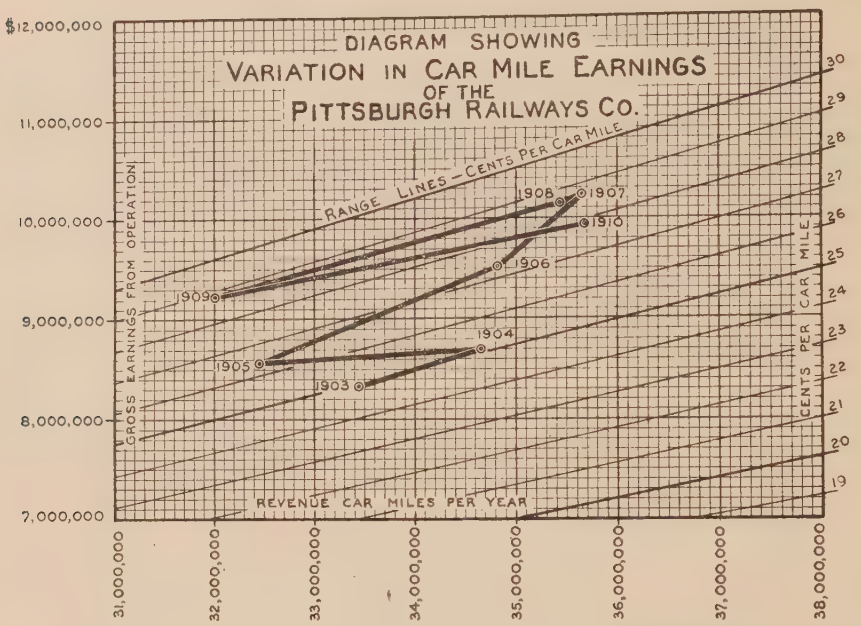
Gross Earnings per revenue car mile increased steadily from an average of 24.1c in 1902 to a maximum of 28.3c in 1908, and on account of the relatively increased number of car miles in 1909, the earnings dropped to 27.4c per car mile.

It will be noted that from year to year the earnings per car mile in the summer months are about 2c higher than the earnings per car mile in the winter months, but that during 1909 the difference between seasons was not so marked.

Operating expenses per revenue car mile increased from 12.1c in 1902 to 16.2c in 1907, while for the last two years, the average has been practically 16c. The monthly fluctuations are not included in the record.

Total Passengers per revenue car mile is the best available measure of service from year to year, as this ratio takes into account the number of transfer passengers. According to this record, the *standard* of service furnished decreased from 1902 to 1908* with a considerable improvement in 1909. The record for the first few months in 1910 agrees closely with previous years.

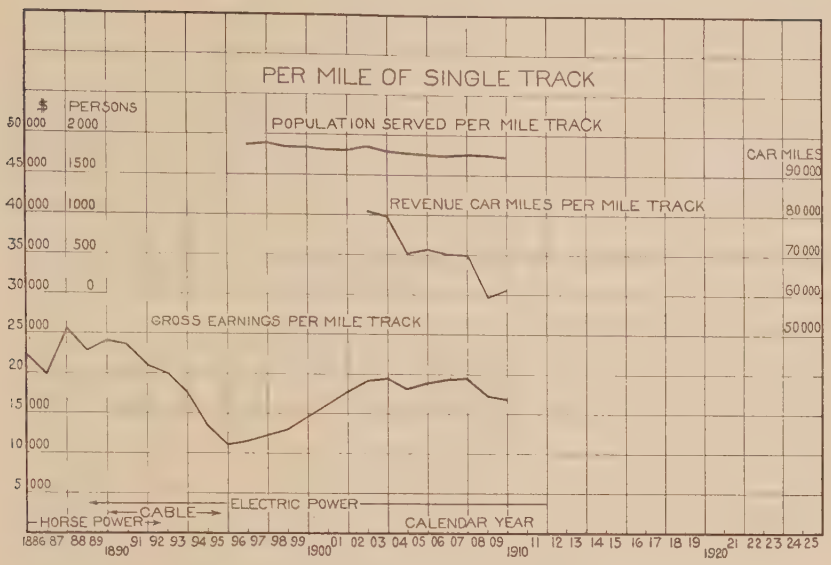
*It has been claimed by the company that this statement is somewhat misleading as the car mile record does not take into account the increase in size of some of the cars gradually put in service during the later years of this period as well as improvement in schedules. In order to ascertain whether this statement should be corrected, an unsuccessful attempt has been made by the writer to secure from the company the seat mile records for the period. In the absence of these seat mile records a more accurate comparison cannot be made than upon the car mile basis taken.



RELATION OF EARNINGS TO CAR MILES.

It is instructive to note the history of the Pittsburgh Railways Company as shown by the above graphical record. This diagram differs from the previous one in that it shows the *relation between two quantities*—earnings and car miles—instead of the yearly variation in one. And the radial lines indicate directly the ratio between these quantities in cents per car mile. The diagram therefore shows at once for each fiscal year three quantities —the earnings—the car miles—and the earnings per car mile.

For the fiscal year ending March 31st, 1903, the earnings were slightly less than 25 cents per car mile. In the following year earnings increased, but the number of car miles were increased in nearly the same proportion and therefore the earnings per car mile increased but slightly. In the following year, 1905, earnings decreased on account of the panic, but car miles were withdrawn at an even greater rate, so that the earnings per car mile increased to 26.4 cents. In 1906 and again in 1907, earnings advanced, but the earnings per car mile also increased. In 1909, the panic affected the earnings and the number of car miles operated was less than for any year since the organization of the system. In this year the average earnings per car mile reached 28.78 cents, the highest record for eight years. In the last fiscal year, however, the earnings have increased and more car miles were run in proportion, so that the earnings per car mile were reduced to 27.79 cents.



RATIO—PER MILE OF SINGLE TRACK.

Population. The slight droop in the upper curve showing the people served per mile of track, indicates that the trackage of the system has increased at a faster rate than the population. In 1897 there were 1870 people served per mile. Although population since then has been constantly growing, the track has extended so much faster, that in 1909 only 1727 people were served per mile.

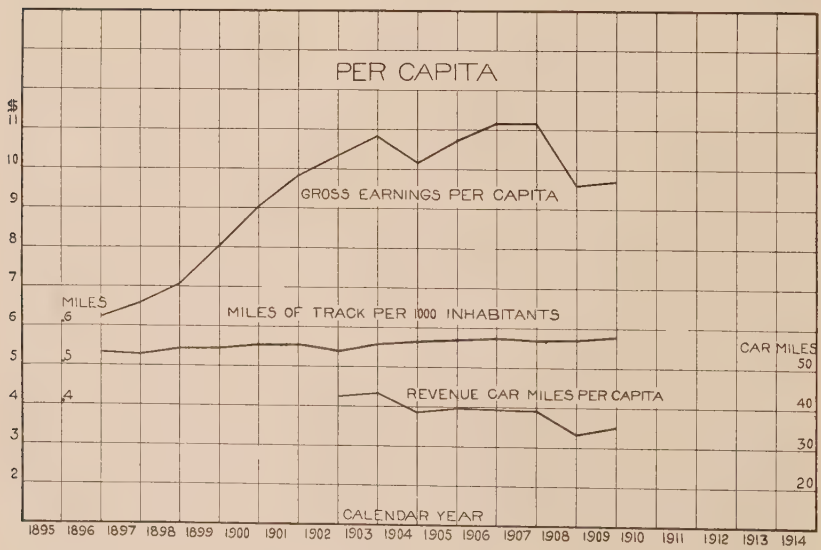
Car miles per mile of track gives a measure of the relative service rendered at different times in carrying capacity. Since 1902, a reduction from 80,000 to 60,000 has been made, although last year shows a slight increase. Outside of the actual car mile service rendered, part of this reduction is due to expansion into suburban territory where less frequent service is demanded.

Earnings. The chief point of interest relative to earnings is the comparison between horse and cable lines and the present electric lines. Horse car lines earned from $20,000 to $25,000 per mile, a record which has never been exceeded in Pittsburgh. The shrinkage in earnings to $12,000 per mile, which followed the building of cable and electric lines was largely due to excessively rapid expansion. Since 1895, earnings per mile have steadily increased to nearly $20,000 per mile although twice checked by business depressions. For the last year the earnings averaged nearly $17,000 per mile.

RATIO-PER MILE OF SINGLE TRACK.
PITTSBURGH RAILWAYS CO.

CALENDAR YEAR	POPULATION SERVED PER MILE TRACK	REVENUE CAR MILES PER MILE TRACK	GROSS EARNINGS PER MILE TRACK
1885	....	.....	22,220
1886	....	.....	20,000
1887	....	.....	25,600
1888	....	.....	22,860
1889	....	.....	24,260
1890	....	.....	23,540
1891	....	.....	20,900
1892	....	.....	20,100
1893	....	.....	17,520
1894	....	.....	13,280
1895	....	.....	11,180
1896	1,870	.....	11,580
1897	1,885	.....	12,400
1898	1,839	.....	12,970
1899	1,837	.....	14,750
1900	1,807	.....	16,300
1901	1,806	.....	17,780
1902	1,858	80,800	19,260
1903	1,798	79,700	19,510
1904	1,772	70,300	18,070
1905	1,753	71,200	18,820
1906	1,742	70,000	19,500
1907	1,760	70,000	19,680
1908	1,751	59,200	16,820
1909	1,727	61,300	16,760

Note A—Mileage excludes Pittsburgh & Castle Shannon R. R. and Inclines—8.97 miles total single track.



PER CAPITA RECORD.

One of the most important factors in studying the transportation system is the average riding habit of the population as measured by the earnings per capita, and the most encouraging aspect is the gradual increase in earnings per capita as the population increases. The actual relation varies in different cities, but in general, it may be said to increase at a rate at least equal to the rate of increase in population.

Earnings per capita in Pittsburgh have increased within recent years from $6.19 in 1896 to a maximum of $11.15 in 1906-7, falling to $9.70 in 1909. At present the average is about $10.00. It is noticeable that the earnings per capita increased at a greater rate before the organization of the Pittsburgh Railways Company than since that date. The depressions of 1904 and 1908 are due to commercial conditions of the District, as elsewhere noted, the latter having a much greater effect.

Track. In miles of track per 1000 inhabitants, the system has grown since 1906 somewhat faster then the population served, from 0.535 to 0.578, or slightly over 8%.

Car Miles. The curve of revenue car miles per capita covers the period of the present Company. It shows a decrease from 42.6 in 1902 to a minimum of 33.2 in 1907, increasing to 35.0 in 1909. This drop may be partly accounted for by extensions of track into outlying territory and the use of larger cars during the later years.

RATIO—PER CAPITA
PITTSBURGH RAILWAYS CO.

CALENDAR YEAR	GROSS EARNINGS PER CAPITA	REVENUE CAR MILES PER CAPITA	MILES OF TRACK PER 1000 INHABITANTS
1896	6.19	....	.535
1897	6.58	....	.530
1898	7.07	....	.544
1899	8.04	....	.545
1900	9.03	....	.554
1901	9.83	....	.554
1902	10.35	42.6	.537
1903	10.83	43.5	.556
1904	10.18	38.8	.564
1905	10.73	39.9	.570
1906	11.15	39.4	.573
1907	11.15	39.1	.567
1908	9.60	33.2	.570
1909	9.70	35.0	.578

RATIOS.

Bank Clearings are a fair index of trade conditions. This curve shows a reasonably uniform ratio; that for every $250 in clearings the railway company earns $1.00, or that earnings are equal to about 4–10 of 1% of banking business done.

Ratio of expenses to earnings from operation of the system is important in furnishing the measure of the Company's policy in returning a certain part of the earnings to the system in various forms, such as car operation, maintenance, etc. This ratio has increased from 50.6% in 1902 to a maximum of 59.2% in 1907. These figures are for calendar years and do not include taxes.

Run off mileage of the system is a nearly constant factor, amounting to about 3% of the total. This covers all the run off and run on, or so called "dead" mileage of strictly revenue earning cars between the car barns and point of service, and is a measure of the proper location of car barns with reference to routes served. This dead mileage is included in all calculations involving revenue car miles.

RATIO—BANK CLEARINGS TO GROSS EARNINGS FROM OPERATION

PITTSBURGH RAILWAYS CO.

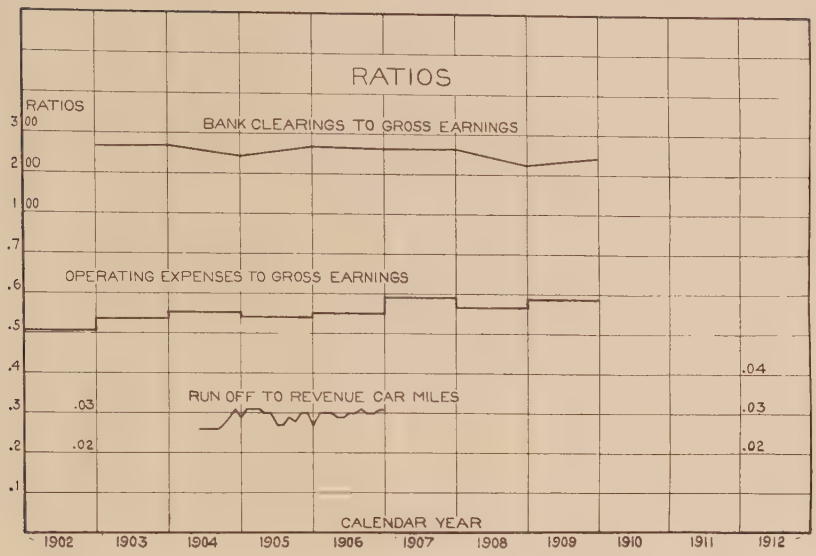
CALENDAR YEAR	RATIO	CALENDAR YEAR	RATIO
1890	.437	1901	.284
1891	.299	1902	.268
1892	.281	1903	.270
1893	.240	1904	.242
1894	.237	1905	.270
1895	.232	1906	.264
1896	.195	1907	.265
1897	.196	1908	.224
1898	.209	1909	.242
1899	.278	.....	
1900	.253	.....	

RATIO—OPERATING EXPENSES TO GROSS EARNINGS FROM OPERATION

PITTSBURGH RAILWAYS CO.

CALENDAR YEAR	PER CENT
1901	....
1902	50.6
1903	53.9
1904	55.1
1905	54.1
1906	55.0
1907	59.2
1908	56.8
1909	58.7

Park Receipts and Park Expenses Excluded.

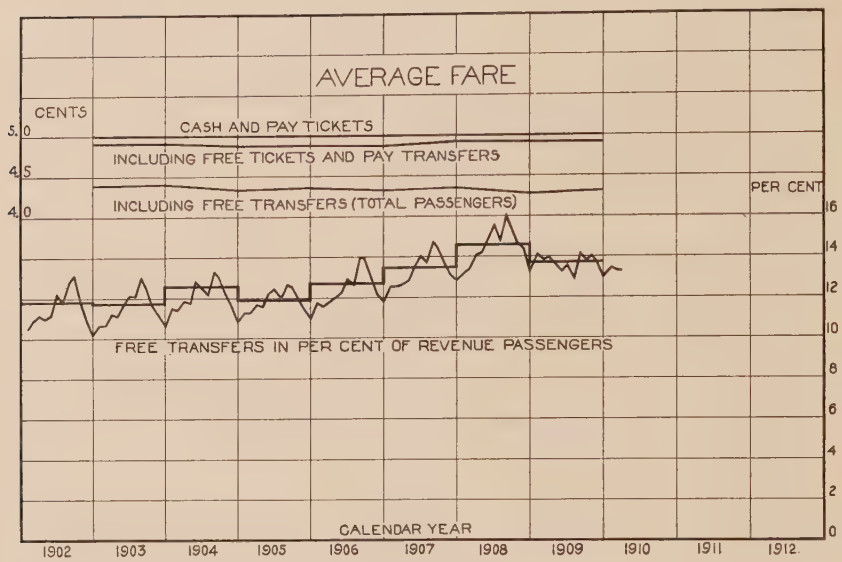


REVENUE RUN OFF CAR MILES OPERATED BY MONTHS

PITTSBURGH RAILWAYS COMPANY

	1904	PER CENT REVENUE MILEAGE	1905	PER CENT REVENUE MILEAGE	1906	PER CENT REVENUE MILEAGE
January	.....	.....	84,337	3.1	87,295	3.0
February	.....	.....	76,641	3.1	79,255	3.0
March	.....	.....	86,577	3.1	86,132	3.0
April	.....	.....	84,572	3.0	82,473	2.9
May	74,002	2.6	88,323	3.0	88,523	2.9
June	71,241	2.6	80,153	2.7	90,357	3.0
Six Months	.....	.....	500,603	3.0	514,035	3.0
July	72,953	2.6	82,613	2.7	91,674	3.0
August	72,013	2.6	87,232	2.9	94,438	3.1
September	69,422	2.7	82,142	2.8	90,301	3.0
October	77,656	2.9	89,119	3.0	91,254	3.0
November	78,902	3.1	84,437	3.0	90,567	3.1
December	80,578	2.9	79,798	2.7	94,343	3.1
Six Months	451,524	2.8	505,341	2.9	552,577	3.1
Total Year			1,005,944	2.9	1,066,612	3.0

Note.—The mileage in this statement is included in statement of monthly car miles operated.



AVERAGE FARE.

Revenue Fare. Dilution of the five cent fare in Pittsburgh is occasioned by two factors, free tickets and pay transfers, in addition to the usual free transfers. Free tickets, being mostly used by employees of the company, constitute only a small percentage of the revenue fare—about 1½% and are negligible. For convenience they are included in the Revenue Passenger Statement. Pay transfers between inclines and the surface lines constitute about 0.5% of the revenue fares, which at the lower rate, occasion some reduction, so that the average revenue fare exclusive only of free transfers, is practically 4.9c. Including free transfers, the average *fare per ride* is diluted to about 4.3c.

Since 1902, this average fare per ride has gradually decreased from 4.4c to the above figure, due to an increase in transfers.

Transfers. The lower curve records the number of free transfers used by revenue passengers to reach their destination, expressed in percentage of the latter for both month and average year. This percentage varies with the seasons, being always higher in the summer. Thus during 1908, the free transfers varied from 13% to 16.2% averaging 14.63%. The average has increased since 1902 from 11.84% to the above figure, the year 1909 showing a drop in transfer traffic to 13.75%.

It is evident from the curve that the average fare per ride must be considerably lower during the summer months that the yearly average.

PASSENGERS HANDLED DETAILED AS TO KIND OF FARE.

PITTSBURGH RAILWAYS COMPANY.

	1902	%	1903	%	1904	%	1905	%	†1906	%
Cash Passengers	153,174,612	85.72	166,803,422	85.44	162,618,003	84.19	176,847,440	84.88	190,168,510	83.65
Pay Tickets	3,044,970	1.70	3,489,021	1.79	3,988,543	2.06	5,009,627	2.41	6,839,194	3.01
Pay Transfers	1,544,296	0.86	1,788,731	0.92	1,928,647	1.00	967,031	* 0.46	990.006	.44
Total Revenue Passengers	157,763,978	88.28	172,081,174	88.15	168,535,193	87.25	182,822,098	87.75	197,997,710	87.10
Free Transfers	18,910,803	10.58	20,542,668	10.52	21,653,434	11.21	22,238,230	10.67	25,856,376	11.37
Free Tickets	2,027,789	1.14	2,600,318	1.33	2,967,481	1.54	3,284,721	1.58	3,483,578	1.53
Total Free Passengers	20,938,592	11.72	23,142,986	11.85	24,620,915	12.75	25,522,951	12.25	29,339,954	12.90
Total All Passengers	178,702,570	100.00	195,224.160	100.00	193,156,108	100.00	208,345,049	100.00	227,337,664	100.00

	1907	%	1908	%	1909	%	1910	%
Cash Passengers	194,368,349	82.43	167,426,628	78.69	174,947,957	78.42	.....	.....
Pay Tickets	8,689,386	3.69	13,807,740	6.49	17,102,917	7.67	.....	.....
Pay Transfers	1,121,233	.47	1,057,275	.49	610,133	.27	.....	.....
Total Revenue Passengers	204,178,968	86.59	182,291,643	85.67	192,661,007	86.36	.....	.....
Free Transfers	28,470,715	12.07	27,555,219	12.95	27,310,495	12.24	.....	.....
Free Tickets	3,149,944	1.34	2,929,395	1.38	3,115,206	1.40	.....	.....
Total Free Passengers	31,620,659	13.41	30,484,614	14.33	30,425,701	13.64	.....	.....
Total All Passengers	235,799 627	100.00	212,776,257	100.00	223,086,708	100.00	.....	.....

NOTE—"Pay tickets" cannot be separated into the classes of fare which range from 2½ cents to 5 cents.

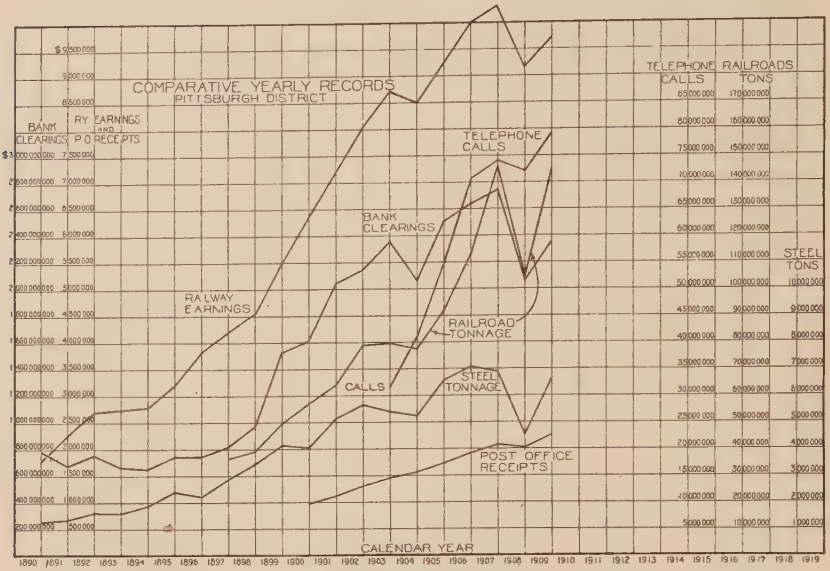
*Decrease due to opening Mt. Washington tunnel.

"Pay transfers" are used to and from the various inclines owned or controlled by the Company or others.

"Free tickets" include those employees which the rules of the Company require to use tickets instead of a badge for passage.

All cash fares larger than five cents are counted as many passengers as five cents will divide into the rate charged.

†Seventeenth Street Incline and Pittsburgh and Castle Shannon Railroad included in 1906 and the following years.


COMPARATIVE YEARLY RECORDS
PITTSBURGH DISTRICT
BANK CLEARINGS
RY EARNINGS AND P O RECEIPTS
TELEPHONE CALLS
RAILROADS TONS
STEEL TONS
TELEPHONE CALLS
BANK CLEARINGS
RAILWAY EARNINGS
RAILROAD TONNAGE
STEEL TONNAGE
POST OFFICE RECEIPTS
CALLS
CALENDAR YEAR
1890 1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919

COMPARATIVE YEARLY RECORDS.

These comparative curves have been plotted to show the relative effects of periods of prosperity and depression in the Pittsburgh District upon railway earnings, and upon other similar indices of commercial conditions, such as

1. Bank Clearings,
2. Steel Tonnage,
3. Railroad Freight Tonnage,
4. Telephone Calls,
5. Post Office Receipts.

Freight tonnage covers all in and outbound freight handled within a district about 40 miles around Pittsburgh, not including freight in transit. Similarly, telephone calls are within the suburban district served. Steel tonnage embraces the output of all mills around Pittsburgh, as reported by the American Iron & Steel Association. Post office receipts cover most of the suburban offices within a radius of 8 miles.

No industry escaped the panic of 1908, but the recovery during 1909 indicates that the District is rapidly regaining the prosperity which it enjoyed during 1906-7. Note that the post office receipts and telephone calls were affected to a much less extent than bank clearings and steel tonnage.

The number of persons alighting is proportional to the area of the circles; number of transfers used proportional to area of squares. Direction of transfer indicated by arrows. Number of transfers in each direction by area of rectangle within squares. The actual record of count is also shown by figures.

PASSENGER MOVEMENT—OUTBOUND—IN

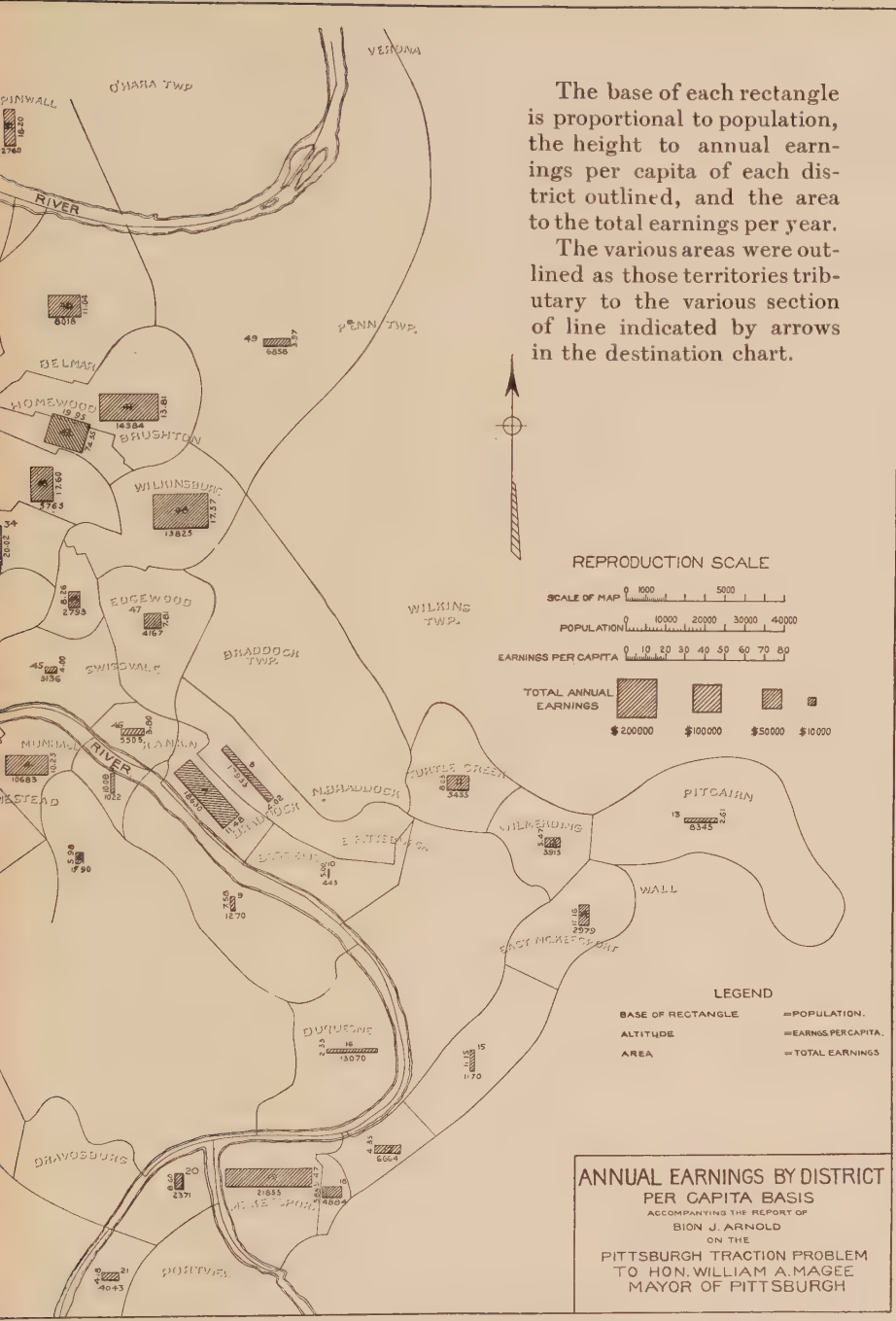
This diagram represents in a relative measure, the destination of the pat
16,500 persons, not shown. Approximately, the total travel per day, outboun
are based upon a traffic count for one day during August, 1906 made by Ford,
alighting within the various sections designated by arrows.

BURGH AND VICINITY FOR TYPICAL DAY.

he railway system. In addition there was a cross-river "business transit" of pound, would be twice that indicated by the diagram. The results here shown Davis, Consulting Engineers, giving by actual count the number of passengers

DISTRIBUTION OF ANNUAL PASSEN

The passenger earnings for the year 1906 were distributed by Ford, Bac here graphically. This map indicates the importance of considering, not on ties necessary for any district. On outlying lines, all population within a di ings per capita varied in 1906 from $2.33 to $28.01, averaging approximately



RNINGS—PITTSBURGH AND VICINITY.

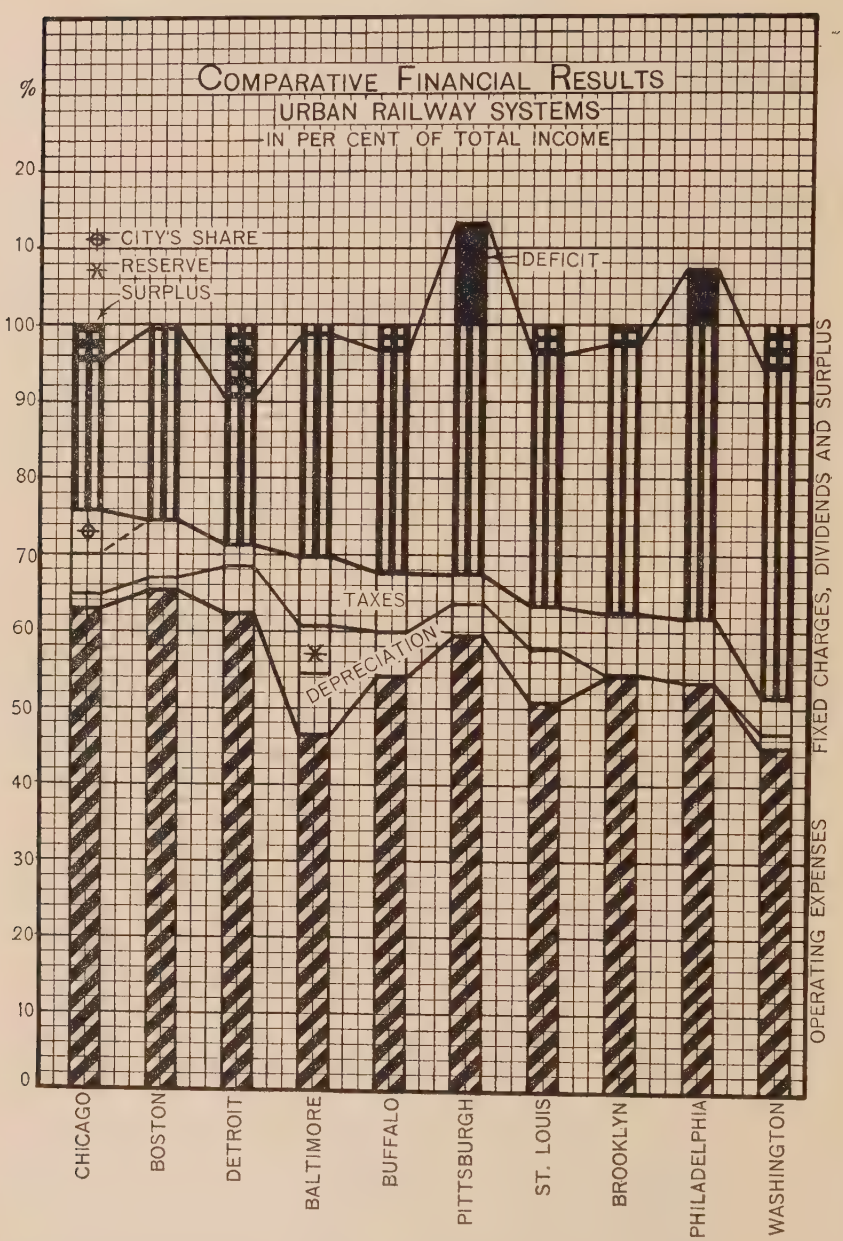
vis, according to a destination count made by them, and the results are shown pulation but also the relative riding habit in studying the transportation facili- 1½ miles on either side of the line is considered tributary to them. The earn- for the entire district.

TRACTION RESULTS IN LARGEST AMERICAN CITIES COMPARED WITH PITTSBURGH

Presenting in comparative form the fundamental data necessary to reach conclusions as to the character and extent of service rendered in Pittsburgh—Comparative financial records, showing the money earned and put back into service—Taxes, Pittsburgh low—Depreciation—Annual earnings from operation—Ratio, expenses to earnings—Track mileage—Car mileage—Graphical analysis of operating results, comparing the value and cost of service in various cities—Earnings and expenses per car mile—Passenger traffic showing transfers—Ratio, passengers per car mile—Average fare—Ratio, earnings, car miles and cars per mile of track—Ratio, earnings and mileage per car.

A comparison of the results obtained by the different surface traction systems in all of the largest American cities is now desirable and illuminating—but conclusions from such a comparison made at this time should be approached with caution. Conditions surrounding different cases vary so that practice is not the same throughout the country; a uniform system of accounting has not yet been universally adopted, exact information is not always available, and a policy of interchanging information, which no doubt will eventually be found desirable, has not as yet proven generally acceptable. Transportation has not yet grown from an art into an exact science; and at present the necessity of a wider interchange of information can only be emphasized with the hope that future comparisons will show a greater tendency toward standardization. The following comparisons have been made from the latest figures that it has been possible to obtain from official sources.

In studying any transportation system, the fundamental items of critical interest are Earnings; Service; Operating Ratio; Deductions from Income, such as Taxes and Depreciation; and Profit to the Operating Company. Other data are also useful in a detailed study, such as Trackage, Equipment, Fares, Transfers, Reserve Funds. It will be noticed that the comparative tables and diagrams show not only the *actual size* of the various systems as indicated by earnings, track and car mileage, but also *ratios*, such as results per car mile and per mile of track, per passenger, etc., so that the systems can also be compared on the unit basis, *irrespective of size.*



COMPARATIVE FINANCIAL RESULTS.

In comparing these ten cities, the income of each city is taken at 100% and the relative distribution (in per cent of this income) for operating expenses, depreciation, taxes, fixed charges and surplus is indicated along the irregular lines. When there is a deficit, it is shown above the 100% line, being excess expenditure over income.

The cities are arranged in the order of their approach to a moderate return to the operating companies. This return is indicated by the upper shaded portion showing demands upon income for fixed charges, dividends and surplus. Thus Chicago ranks first—24%, Pittsburgh sixth—32.6%.

The lower shaded portion represents what part of income is absorbed in operating expenses.

Description of Opposite Diagram.

To facilitate comparison of the records from these various cities, the most important data and ratios are presented in graphical as well as tabular form. Of these tables the first five relate to the financial result shown graphically upon the opposite diagram in the form of percent of income, viz:

1—*Company Return*, comprising fixed charges, dividends and surplus (or deficit).

2—*Service Rendered*, as indicated by operating expenses.

3—Depreciation charges (paid or reserved).

4—Taxes paid out.

Of these quantities, the first two are of the greatest importance; the first represents the total amount retained out of income for interest and for return to the operating company or its subsidiaries; the second, what part of income is put back into the service. The comparison shows (a) that, in service rendered, three other cities, Chicago, Boston and Detroit get back a larger percentage of the fare than Pittsburgh. (b) that Pittsburgh does not appropriate out of earnings, as much for renewals due to depreciation (*) as some of the other cities. (c) that the taxes paid by the railway system in the Pittsburgh District are at present comparatively small. (d) that only two cities incurred a "Deficit" last year, Pittsburgh and Philadelphia, several, on the other hand, clearing a substantial surplus. It is instructive to note, that in Chicago and Boston, the return to the companies in the form of "fixed charges, dividends and surplus" is relatively smaller than in any other cities. In Chicago, both investment and return are determined in the new traction ordinances, while in Boston the capitalization is regulated by the State Railroad Commission. The results are that the riders in Chicago obtain their transportation by returning to the Company about 24% of the fares paid, while in Boston they return about 26%. In Pittsburgh, however, the "fixed charges" amounted to 45.8%, but on account of a 13.2% "deficit" the actual return to the company was 32.6%. If this deficit is to be collected out of future earnings, then Pittsburgh's patrons will pay a higher relative return to the Company for their transportion than in any of the other American cities shown with the exception of Washington.

* It should be explained in connection with Chicago results that the low depreciation charge is due to the rehabilitation work in progress. Later, an annual charge of not less than 8 per cent. of the gross receipts for renewals is provided for by ordinance in addition to not less than 6 per cent. of gross receipts for ordinary maintenance. Baltimore's contingent reserve is regarded as depreciation, and Chicago City's share in profits as additional taxes. Brooklyn and Philadelphia do not disclose their methods of treating depreciation.

COMPARATIVE FINANCIAL RESULTS.

FIXED CHARGES DIVIDENDS AND SURPLUS.

City or District	Rank 1 / Col. 6	Report Fiscal Year Ending	Percent of Total Income from all Sources: Fixed Charges and Dividends	Surplus or Deficit	Total made by Company
1	2	3	4	5	6
Chicago *.....	1	Jan. 31, 1910	19.42	° 10.04 ‡ 4.45	° 29.46 ‡ 23.92
Brooklyn.....	8	June 30, 1910	35.15	2.52	37.67
Philadelphia....	9	June 30, 1910	45.26	—7.18	38.08
Boston.....	2	Sept. 30, 1909	25.56	0.26	25.82
St. Louis.....	7	Dec. 31, 1909	32.82	3.92	36.74
Baltimore.....	4	Dec. 31, 1909	28.78	1.43	30.21
PITTSBURGH ..	6	Mar. 31, 1910	45.84	—13.21	32.63
Cleveland.....	..	Dec. 31, 1909	.....	.....	.....
Buffalo.....	5	Dec. 31, 1908	29.13	3.30	32.43
San Francisco...	10	Dec. 31, 1909	x39.10	5.30	44.40
Cincinnati.....	..	Apr. 30, 1909	.....	.....	.....
Detroit.....	3	Dec. 31, 1909	17.50	9.52	27.02
Milwaukee.....	..	Dec. 31, 1909	.....	.....	.....
New Orleans....	..	Dec. 31, 1909	.....	.....	.....
Washington....	11	Dec. 31, 1909	†42.45	† 5.96	†48.41

Note.— Data for other than above fiscal years noted in all cases.
*Four surface roads under Board of Supervising Engineers.
°Including City's share. ‡Net to Company.
†Capital Traction Co.
xIncluding Taxes.

In this and the following table, returns for the last fiscal year available are listed for the first fifteen cities of the United States. These cities are listed (Col. 1) in the same order but are *ranked* (Col. 2) in each table according to the most important factor, as noted below. This first table alone cites the fiscal year upon which the returns, for the most part, are based, exceptions being noted.

From the viewpoint of the riding public, this table possesses an unusual interest, as it shows what portion of the fare is retained by the operating company as returns from its investment. Whether or not the return is entirely adequate in each case involves a number of factors not shown here.

The proportion of income actually earned by the companies is shown in the last column, comprising fixed charges as well as dividends, also surplus. No distinction has been made between fixed charges and dividends, as they all represent company return in some form. Where a deficit occurs, the total return is shown in Column 4. This however is a theoretical return, and only becomes actual if taken out of future earnings.

RATIO OF OPERATING EXPENSES TO GROSS EARNINGS.

	Rank	Percent of Gross Earnings from Operation: Transportation and Power	Total Operating Expenses less Taxes	Operating Expenses and Taxes
Chicago	2	41.59	63.20	68.25
Brooklyn	8	31.35	56.08	64.15
Philadelphia	10	32.91	54.38	63.00
Boston	1	42.43	66.76	74.22
St. Louis	11	.....	51.05	58.08
Baltimore	13	28.43	46.62	55.64
PITTSBURGH	5	36.19	59.92	64.16
Cleveland	4	33.46	60.15	64.75
Buffalo	9	.....	54.49	60.20
San Francisco	7	.....	56.93	.....
Cincinnati	..	.....	.....	.....
Detroit	3	*36.44	62.70	65.89
Milwaukee	12	.....	48.95	55.95
New Orleans	6	.....	58.59	.....
Washington	14	†30.00	†45.10	†50.03
		Average	57.5	64.07

Note—*For 1908.
†Capital Traction Co.

This important ratio indicates what part of the income is put back into the service. The service supplied primarily depends on how much money is expended out of earnings for operation, the rule being that in any given case, the higher the percentage, the better the quality of the service. According to this table, the Pittsburgh system spent less for service last year (not including taxes) in proportion to earnings than Boston, Chicago, Detroit or Cleveland but more than the remaining cities.

The operating cost is subdivided into three classes, first—operating expense for transportation and power, covering wages of trainmen, carhouse expense and power supply, second—total operating expense, including maintenance, damages and all general expenses not including taxes, and third—total operating expenses plus taxes.

The percentages are shown in these three ways, and the variation between the cities is wide. Thus, for transportation and power the percentage varies from 28.4 to 42.4%, for total operating expenses not including taxes, it varies from 46.6% to 66.8%, averaging 57.5%, with Pittsburgh 59.9%; for operation, *including* taxes, the percentage ranges from 55.6 to 74.2% with Pittsburgh about the same as the average—64.1%.

DEPRECIATION.

	Rank	Annual Payment or Reserve for Fund	Percent of Gross Earnings
Chicago	3	$ 468,392	2.07 *8.00
Brooklyn	11	‡ 148,806	0.75
Philadelphia	..	.....	....
Boston	10	200,000	1.407
St. Louis	7	609,760	5.51
Baltimore	5	556,720 †456,693	7.72 6.33
PITTSBURGH	**9**	366,198	3.68
Cleveland	..	.....	....
Buffalo	4	403,280	7.76
San Francisco	..	.....	....
Cincinnati	..	.....	....
Detroit	6	400,000	6.30
Milwaukee	1	° 519,516	12.23
New Orleans	..	.....	....
Minneapolis—St. Paul	2	703,000	10.15
Washington	8	¶232,178	3.80

Note—*Including rehabilitation work now under way.
†Special reserve subject to distribution by Directors.
‡1909.
°Includes reserve for light and heat department.
¶Includes lighting department in Washington Railway & Electric Co.

In several cases, depreciation is handled as a fixed annual reserve, subject to adjustment from time to time. The entire amount appropriated annually has been set down regardless of actual expenditures for the year considered, the surplus being credited to the fund at the end of the year. Detroit, Milwaukee, St. Louis and St. Paul maintain such funds. St. Louis appropriated 5% per annum for the last four years, increasing to 6% for the last six months of 1909; Milwaukee reserves 10%, and Minneapolis and St. Paul have increased appropriations up to 9% in the past year.

As Chicago is undergoing rehabilitation, the so called depreciation is not entirely comparable with those of other cities. This rehabilitation work is mandatory and the annual expenditure fixed by ordinance so as to bring the total of operating expenses, taxes and renewals up to 70% of the gross receipts. Until this rehabilitation is completed, the actual assignment to depreciation account will not be comparable. After rehabilitation the renewals account will be charged with at least 8% of the earnings.

Pittsburgh's depreciation account is carried in the form of "extraordinary maintenance," a special account started in 1907. It includes the retirement each year of a portion of an issue of Car Trust Notes. The account stands as follows:—1907–3.33%, 1908–3.28%, 1909–1.31%, 1910–3.69% of the gross earnings.

TAXES.

	Rank	Taxes Paid	Percent of Gross Earnings
Chicago	1	$ 1,144,777	5.05
		*1,276,252	5.59
Brooklyn	4	1,687,130	8.07
Philadelphia	3	1,569,858	8.62
Boston	6	1,063,775	7.48
St. Louis	7	773,980	7.00
Baltimore	2	650,547	9.02
PITTSBURGH	13	418,127	4.21
Cleveland	12	291,874	4.62
Buffalo	9	297,106	5.71
San Francisco	10	§ 347,920	5.07
Cincinnati	..	.....	....
Detroit	14	202,510	3.19
Milwaukee	8	†363,662	6.19
New Orleans	5	‡481,750	7.98
Washington	11	°300,365	4.91
		Average	7.58

Note.—*City's share in net income. §1908.
†Includes Lighting Departments.
‡Includes Lighting and Gas Department.
°Includes Lighting Department of Washington Railway & Electric Company.

Of the cities reported, railway taxes ranged from 3.2 to 10.6% averaging 7.58% of the gross earnings, excluding Chicago. There an unusual condition exists in that the railway company pays to the city 55% of its net income. This may be regarded somewhat in the light of a special tax, raising the total tax in which the city participates to 10.64% of the gross railway earnings, the highest listed.

Philadelphia has a special annual charge in the form of a fixed payment or license which is imposed by the city in lieu of company liabilities for street maintenance, along its tracks, waived by the city, partly in return for the company's forfeiture of its perpetual franchises, city representation, etc. This brings the total tax in Philadelphia up to 8.62% in 1910.

Baltimore's tax is slightly over 9%—largely in the form of a local "Park Tax" of 9% imposed by the city on all public utilities. The tax in Baltimore has increased by more than 2% in the last two years.

Brooklyn has increased from 4.5% to 8.07% within the last three years including an appreciable reserve in 1910 for special franchise taxes in litigation.

Excepting Detroit, the Pittsburgh system pays the lowest taxes of the cities listed—4.21% and considerably below the average. This total comprises state, borough and municipal taxes on value of stock and bonds, gross earnings, cars, poles and wires. Some of these taxes are now in litigation.

RECORD OF ANNUAL EARNINGS FROM OPERATION.

	Rank	Passenger Earnings	Gross Earnings from Operation	Total Income from all Sources	Percent Passenger of Gross	Percent Gross of Total
Chicago*.....	1	$22,134,589	$22,641,879	$22,832,883	97.80	99.15
Brooklyn†.....	2	°20,477,145	20,906,930	21,515,541	97.85	97.15
Philadelphia†....	3	17,991,100	18,189,939	18,501,356	98.95	98.30
Boston†.....	4	14,024,768	14,212,557	14,493,853	98.75	97.06
St. Louis.....	5	10,918,193	11,056,088	11,111,431	98.76	99.50
Baltimore.....	8	.....	7,209,984	7,212,474	.....	99.96
PITTSBURGH...	6	.....	9,222,016	10,000,970	§98.4	92.22
Cleveland.....	10	6,144,166	6,311,022	6,349,388	97.35	99.40
Buffalo.....	11	5,056,741	5,195,583	5,226,983	97.30	99.40
San Francisco...	7	.....	7,455,965	7,630,091	x99.15	97.70
Cincinnati.....	12	.....	.....	4,731,731	.....	.....
Detroit.....	9	6,106,599	6,349,724	6,417,731	96.2	99.0
Milwaukee.....	13	.....	4,220,609	.....	.....	.....
New Orleans.....	14	.....	.....	4,101,546	.....	.....
Washington.....	..	.....	.....	.....	.....	.....

NOTE—*Surface Railways only.
†Include Elevated Roads and Subways.
°Surface Lines—60% of total Passenger Earnings.
x1907.
§Calendar year 1909.

In this Table is given the actual amount of earnings for the last fiscal year as reported by the various railway companies. These earnings are divided into annual passenger earnings, total gross earnings from operation, and total income from all sources. Ratios between these three quantities are also given. The difference between the passenger earnings and the total gross earnings is generally made up of the earnings from mail, express, milk and freight cars, from rental of operating equipment, from sale of power and from advertising. These items, however, form but a small proportion of the total. The passenger receipts constitute practically the entire earnings from operation—from 97 to 99% for the cities listed.

This table also shows total income from all sources. The excess over gross earnings is known as "income from other sources" which includes income from real estate, buildings and equipment not used in the operation of the road, interest and dividends on the investments, etc.

Gross earnings constitutes from 97 to 99% of the total income. Excluding, as it does, the results of so called auxiliary enterprises, this quantity—gross earnings—forms the best comparative measure of the actual results from operating a railway property.

The cities are here listed in the order of their gross earnings, New York excluded on account of the unusual conditions existing in that city. Without Brooklyn, the total earnings in New York City alone are nearly $50,000,000 per year.

TRACK MILEAGE.

	Rank	Operated, through Single Track	Total all Tracks	Percent. Operated of Total
Chicago	1	.....	666.20	†91.80
Brooklyn	3	538.29	606.59	°88.80
Philadelphia	2	.....	627.65	§°93.46
Boston	6	431.44	484.12	°89.11
St. Louis	5	453.01	.....	*94.70
Baltimore	7	400.76	.....	*95.95
PITTSBURGH	4	561.65	581.00	96.60
Cleveland	12	.....	258.00	.....
Buffalo	9	.....	x374.23	*92.60
San Francisco	11	258.41	.....	*94.60
Cincinnati	13	219.88	.....	.....
Detroit	8	.....	402.88	*91.30
Milwaukee	10	355.82	.....	*96.55
New Orleans	15	186.25	197.72	94.19
Washington ‡	14	.....	207.68	*96.00

Note—*1907. §1909. x1910.
†Surface only.
°Includes elevated and subway.
‡Includes Wash. Ry. & Elec. Co.

In this table is given the latest available statement of operated and total trackage of the principal street railway companies. New York City proper is purposely omitted as the operating conditions are hardly comparable. The cities are listed with respect to total trackage, and Pittsburgh appears to be one of the largest systems, ranking fourth with a total mileage of 581. Even deducting 60 miles of Interurban track extending south from Castle Shannon to Charleroi and Washington, it still retains this position. Brooklyn, having 71 miles of elevated line, ranks but slightly higher with 607 miles. Counting only surface mileage of the cities listed, *Pittsburgh ranks second or third*—a fact that should be borne in mind for later discussion.

In all cities a not inconsiderable part of the total represents trackage in car barns, storage sidings, etc., exceeding in some cases where the car equipment is extensive, 10 per cent of the total. Apparently Pittsburgh has less auxiliary track than any of the cities. This is partly due to the interurban mileage operated, along which less storage facilities are required than in the denser urban districts. About one-half the total of the Pittsburgh system trackage lies outside the city limits. Approximately the same proportion exists in Detroit and Milwaukee. Detroit, however, ranking only eighth in mileage, has two-thirds more auxiliary track than Pittsburgh, more than St. Louis and nearly as much as Philadelphia.

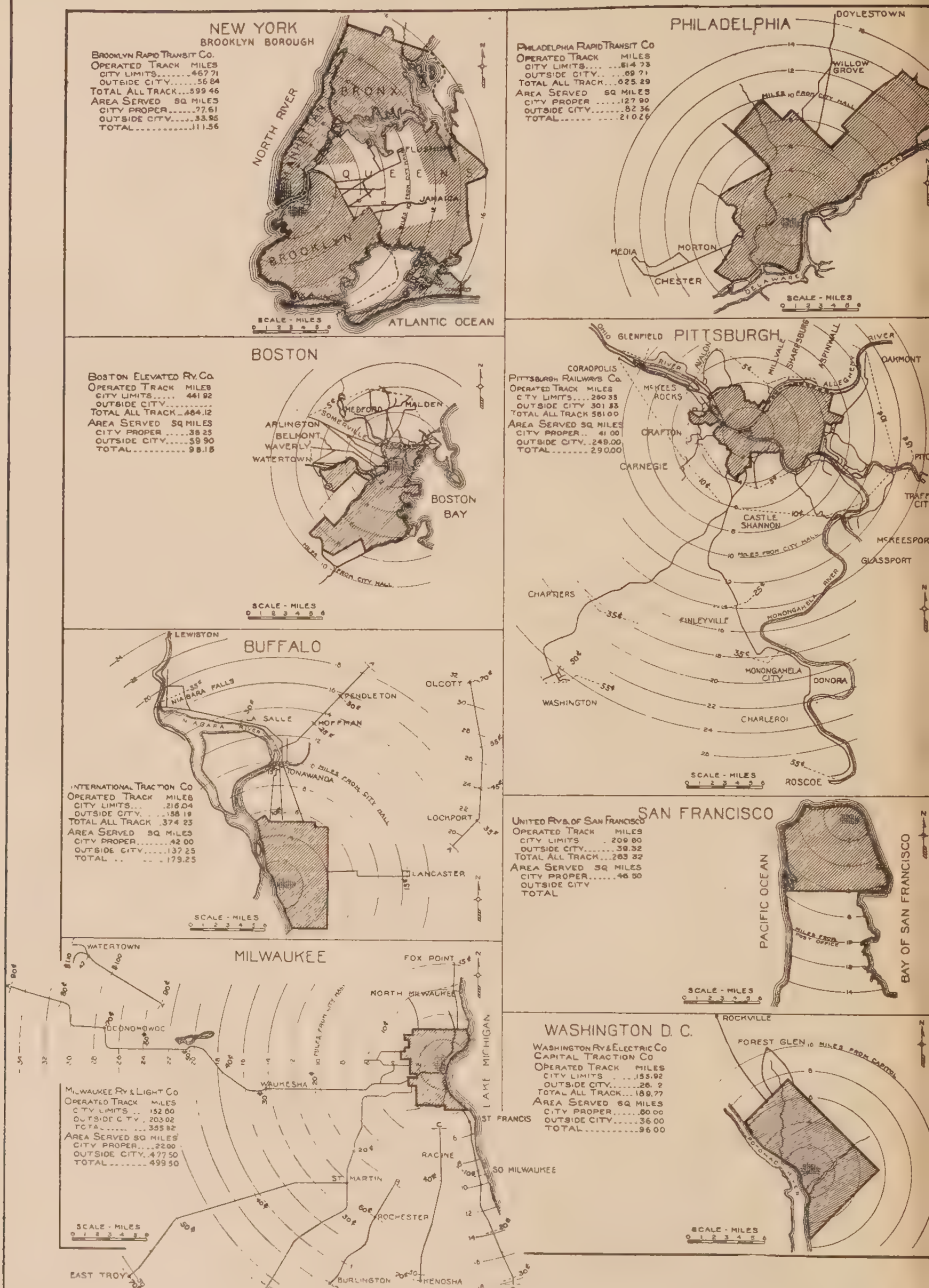
RECORD OF CAR MILES OPERATED.

	Rank	Revenue or Passenger Car Miles	Total Car Mileage	Percent Revenue of Total
Chicago	1	85,788,797	.....	98.80*
Brooklyn	2	77,984,651	.....	.....
Philadelphia	3	.....	70,943,404	99.55°
Boston	4	50,895,256	51,127,681	99.60
St. Louis	5	38,711,623	.....	99.15*
Baltimore	7	27,124,556	.....	.....
PITTSBURGH	6	35,690,301	36,157,086	98.75
Cleveland	8	24,614,268	.....	.....
Buffalo	11	19,555,087	19,807,009	98.75
San Francisco	14	12,670,482*	12,733,829*	99.55*
Cincinnati	10	20,717,888*	20,761,897*	99.80*
Detroit	9	.....	26,305,513	98.40x
Milwaukee	13	16,019,114	.....	.....
New Orleans	12	18,718,605	.....	98.30*
Washington	..	.....	.....	.....

Note---*For 1907.
x1908.
°1909.

This table shows the service rendered in car miles per year, for the same period as covered by the earnings table. This record is also subdivided under two headings, revenue car miles and total car miles, with the ratio between these two classifications where the information was available. Revenue mileage includes all passenger and chartered cars and consequently is the measure of passenger service. It will be noticed that the mileage of other than passenger cars is a comparatively insignificant proportion of the total run, usually less than one percent. This is made up of milk, freight, express, mail and miscellaneous service cars. Pittsburgh appears as sixth in car mileage.

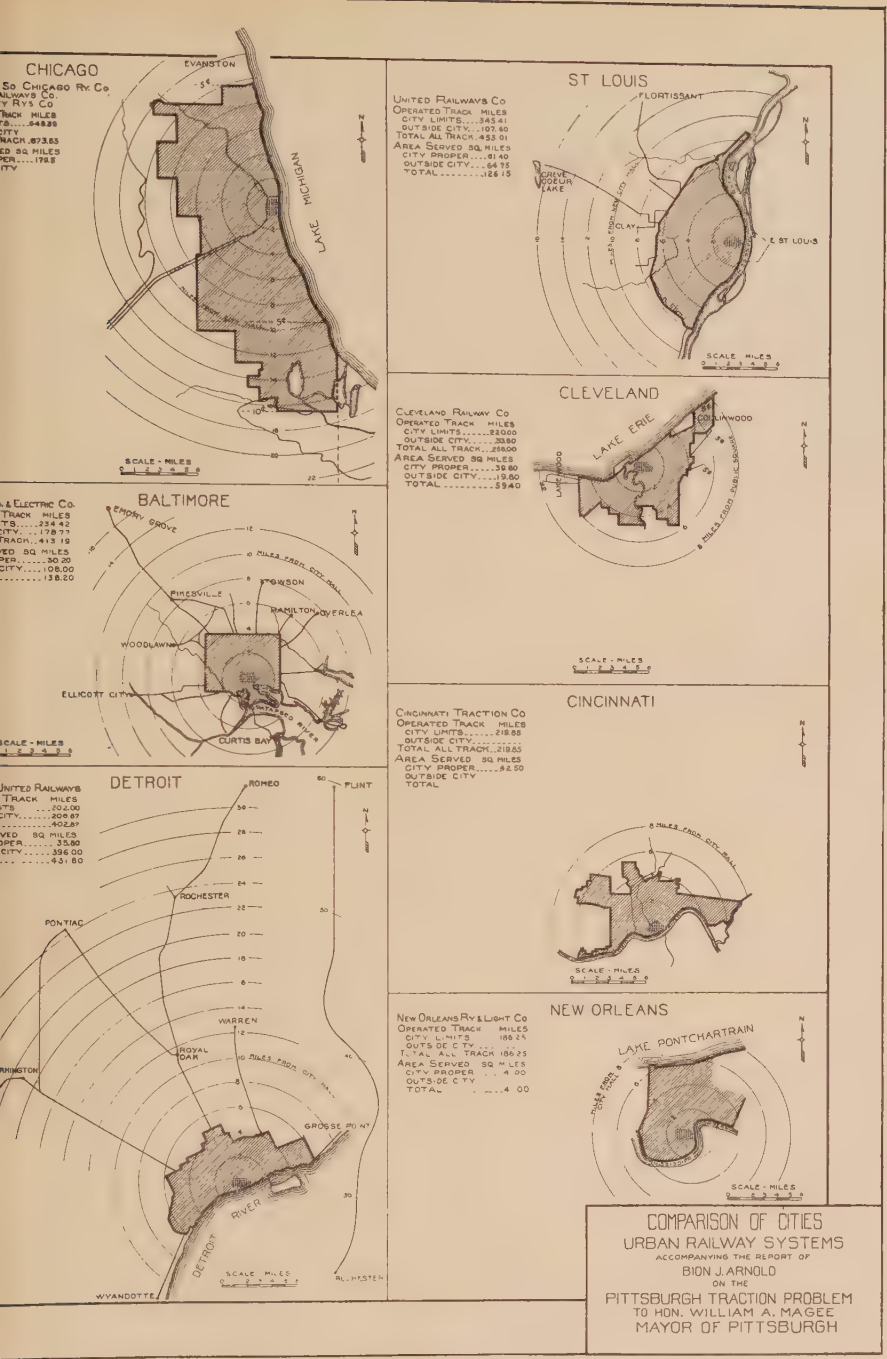
Practice varies considerably in recording trailer car mileage. Thus in Pittsburgh trailers are counted as full sized cars, while in Cleveland, for example, the trailer mileage is multiplied by 60% before being recorded as car mileage. Thus car mile records with trailers counted equal to motor cars will be larger in comparison than records with the trailer miles reduced by some percentage factor. Conversely, all the car mile ratios in the following tables will be correspondingly lower.



COMPARISON OF SIZE AND CONFIGURATION O

Each American City has a business "center" which has developed about the " transportation each city developed first along the water front, and afterwards as me being the result of the topography of the district. In cities where the electric sub and Detroit, these lines have been added to the maps. Independent lines are not

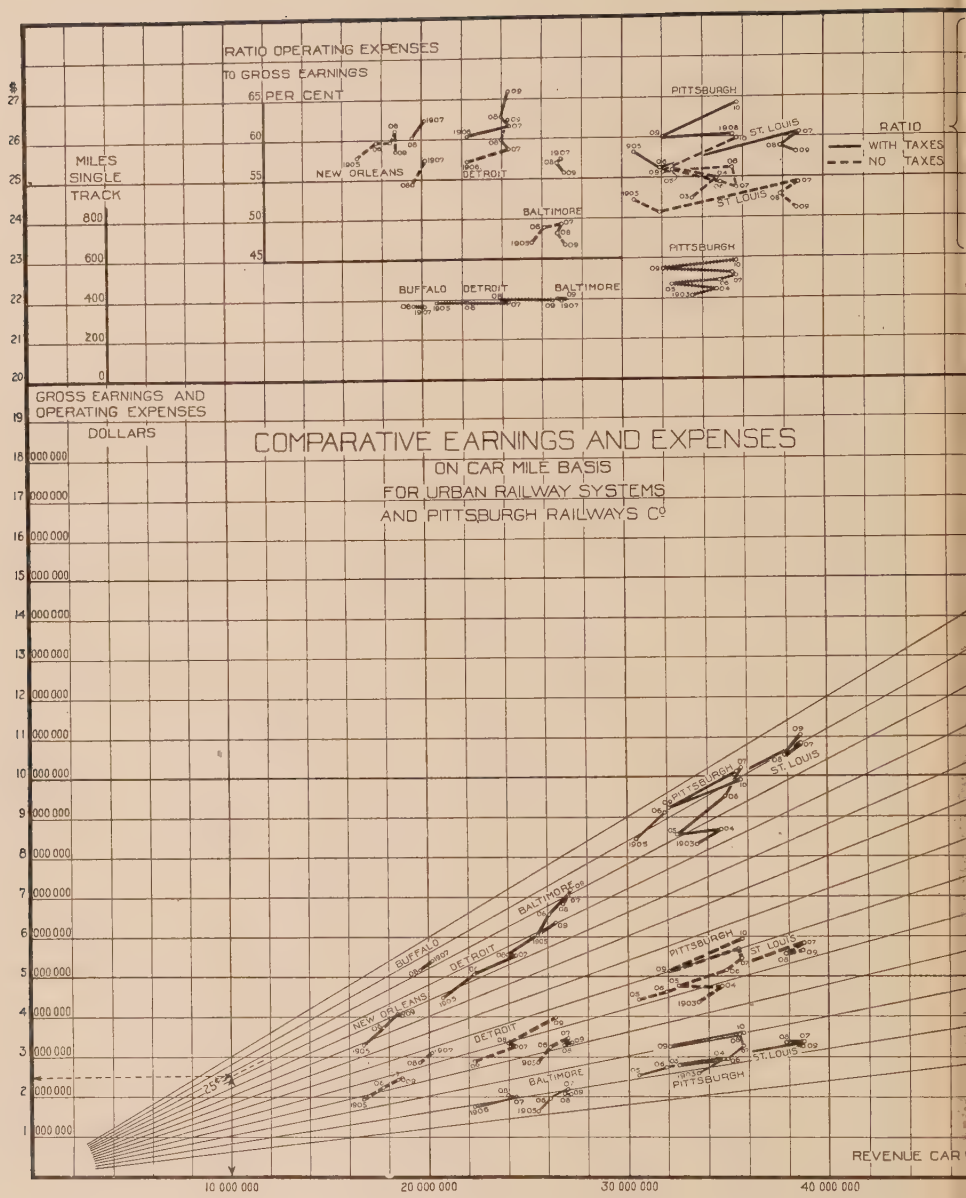
The transportation problem is largely one of transporting the workers from an sufficient for adequate service during these peaks, it will be ample for all other tim business center increases. *Pittsburgh is unique in that its "business center" is n*



RGEST AMERICAN CITIES—ON SAME SCALE.

' of the city. As the first contact with the outside world was by means of water land transportation were developed, the city spread out, its particular shape are operated directly by the city traction system as in Pittsburgh, Milwaukee

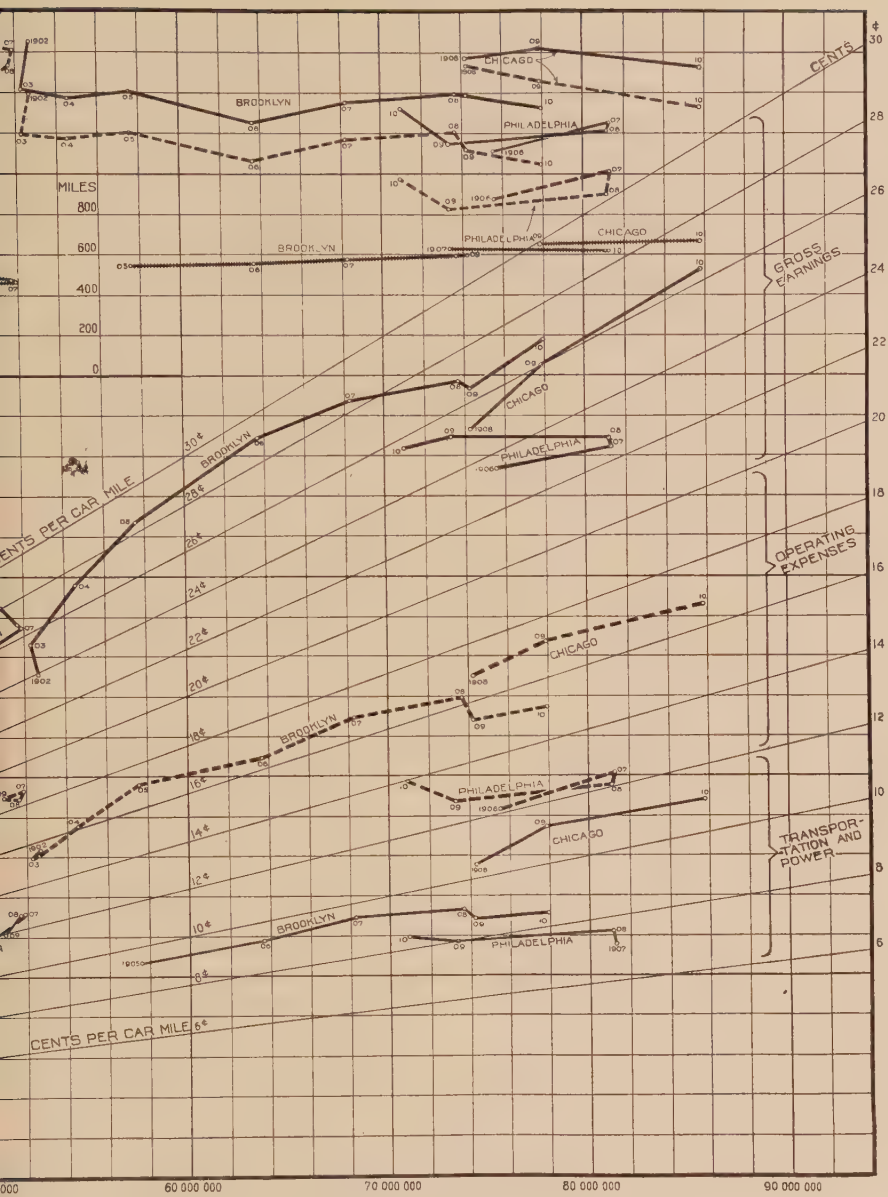
eir homes during the morning and evening rush. If the traction equipment is he problem becomes more and more difficult as the radius of service from the *ne side of the city.*



COMPARISON OF LARGE URBAN RA

On this plate is recorded the service rendered from year to year in lines indicate directly the ratio between these quantities in cents per car mile; th year the earnings per car mile will be 25 cents, as indicated by the dotted radial through all other intersections where the ratio between earnings and car miles is a car mile basis. This diagram shows at once the income and operating expenses be compared from year to year with its previous record and with those of other sy

This plot also records along the upper margin *variations* in operating rat basis of car miles.



Y SYSTEMS ON CAR MILE BASIS

iles with the corresponding earnings and operating expenses. The radial 10,000,000 car miles are run per year with earnings of $2,500,000.00 per g through the intersection of the arrows. This 25 cent line would also pass Therefore these radials make it possible to compare *large or small* systems on *r mile* for each system for each year, so that the records of each system can

h with and without taxes, and just below, the total track mileage, all on the

GRAPHICAL ANALYSIS OF OPERATING RESULTS
ON CAR MILE BASIS

The accompanying plate is most important in showing the results in Pittsburgh for the past eight years compared with those from other American cities for a period of years. This diagram differs from the preceding ones. *Revenue car miles* are plotted along the horizontal axis, *gross earnings* along the vertical axis, thus showing the *relation between two quantities* instead of the yearly variation in one.

The diagram shows at once the relative earnings per car mile form year to year of the various systems. On account of the slight difference in fares, the difference in the average length of rides in the various cities, the variation in the size of the cars and the character of the riding in different localities, earnings per car mile is not an *exact* measure, but taken in connection with the other elements of the analysis it is the most consistent one for comparing each system with itself from time to time and for making a relative study of the different systems.

It will be noted, for instance, that in Brooklyn the earnings per car mile *increased* from 24 cents in 1902 to 29 cents in 1906 and *then decreased* to 26.85 cents in 1910. In Philadelphia the earnings per car mile first *decreased* from 23.4 cents in 1906 to 22.48 cents in 1907 and then *increased* to 25.6 cents in 1910. In Boston, the tendency has been to increase the earnings per car mile slightly each year until 1909, when for some reason the number of car miles operated were reduced, although the earnings increased, the result being that the earnings per car mile showed a decided increase during this last year. St. Louis has consistently shown earnings near the 28 cent line until 1909 when the record shows 28.57 cents. Pittsburgh's record has been more erratic than the other cities. During the panics of 1904 and 1908 there was a much greater reduction in car miles in Pittsburgh than in any other city. On the other hand Pittsburgh shows a larger increase in car miles in proportion to the increase in earnings during the last year than any other city. The diagram indicates graphically the information shown in detail in the following tables:

GROSS EARNINGS FROM OPERATION PER REVENUE CAR MILE-CENTS

	1903	1904	1905	1906	1907	1908	1909	1910	Average Since 1905
Chicago	.....	.....	.....	.....	.....	25.17	.....	26.40	.....
Brooklyn	25.38	27.00	28.36	29.03	28.39	26.97	26.53	26.85	27.55
Philadelphia	.....	.....	.....	23.41	22.48	22.76	25.23	25.62	23.90
Boston	.....	.....	25.69	*26.19	*26.45	26.75	27.93	.....	26.83
St. Louis	.....	.....	27.70	28.52	27.88	27.88	28.57	.....	28.21
Baltimore	.....	.....	23.68	25.30	26.04	25.54	26.58	.....	25.86
PITTS'BG	24.88	25.09	26.42	27.31	28.70	28.61	28.78	27.79	28.24
Cleveland	.....	.....	.....	.....	.....	.....	25.62	.....	.....
Buffalo	.....	.....	.....	27.15	26.85	26.56	.....	.....	26.85
San Francisco	.....	.....	.....	.....	37.45	.....	.....	.....	.....
Cincinnati	.....	.....	.....	.....	21.51‡	.....	.....	.....	.....
Detroit	.....	.....	.....	23.13	23.08	23.52	24.12†	.....	23.47
Milwaukee	.....	.....	.....	25.95	26.00	26.73	27.05	.....	26.43
New Orleans	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washington	.....	.....	.....	.....	.....	.....	.....	.....	.....

Note.—*From Passenger income.
†On total car miles.
‡On total income.

In Pittsburgh, earnings per car mile increased by irregular steps year by year from 24.9c in 1903 to 28.8c in 1909, but for the fiscal year ending March 31, 1910, the earnings reduced to 27.8c. A continuation in this rate of reduction for another year would bring the earnings per car mile for the present year's business down to a figure which would compare favorably with many of the other cities in the country. Thus by projecting the 1909-10 line, at 40,000,000 car miles per year, the earnings would reduce to about 26.6c per car mile, about on a par with Chicago, Boston, Baltimore and Buffalo. But Pittsburgh has averaged for several years past higher in earnings per car mile than any of the cities except St. Louis.

In making comparisons with other cities, it must be remembered that the results reported from Boston, Brooklyn and Philadelphia include the earnings from operation of the elevated roads, which in those cities form a part of the complete system with transfer privileges, in many cases between the surface lines and the elevated trains.

This diagram is equally useful in studying the operating expenses which are plotted in the next lower group of curves shown by the broken lines. Similarly, the cost of transportation and motive power is shown by the lowest group of solid lines. In general these three groupes of curves show the same characteristics i. e. rise and fall together. For reference, the operating ratio, both with and without taxes, is plotted along the upper margin of the diagram, the broken line indicating the usual ratio—not including taxes.

OPERATING EXPENSES PER REVENUE CAR MILE-CENTS

	Rank	Transportation and Power	Operating Expenses	Expenses and Taxes
Chicago	2	10.97	16.68	18.02
Brooklyn	6	8.41	15.05	16.91
Philadelphia	9	8.44	13.94	16.16
Boston	1	11.84	18.64	20.73
St. Louis	7	8.46	14.58	16.57
Baltimore	12	7.55	12.39	14.79
PITTSBURGH	3	10.06	16.66	17.83
Cleveland	4	8.58	15.42	16.60
Buffalo	8	.....	14.47	15.99
San Francisco	..	.....	.....	.....
Cincinnati	..	.....	.....	.....
Detroit	5	8.58*	15.14°	.....
Milwaukee	10	.....	12.89	14.74
New Orleans	11	.....	12.83	.....
Washington	..	.....	.....	.....

Note—*For 1908.
°On basis of total car miles.

The curves of operating expenses and transportation cost both varied within much smaller limits than the Earnings notably for Boston and Brooklyn. Thus the operating expense in Brooklyn ranged from 15c. to 17c. per car mile, while the earnings varied from 24c. to 29c. per car mile. But during this period the operating ratio fell from 65% to 56%. This plot shows that the betterment in service in Brooklyn during the last three years as indicated by the *droop* in the earnings per car mile curve, was largely assisted by a reduction in operating expense. Although many of the cities show some retrenchment in service during the depression of 1907-8, Pittsburgh cut its service to a very marked degree.

For further comparative purposes, track mileage has also been plotted on this plate. To illustrate: the Brooklyn system increased its car mileage steadily with its track mileage. In Pittsburgh, however, the trackage extended rapidly year by year with only a very small increase in the car mileage, and in two years a large decrease in service is recorded. Pittsburgh mileage is practically equal to that of Philadelphia, and Brooklyn, both of which operate more than twice as many car miles per year.

PASSENGERS CARRIED PER YEAR.

	Rank	Revenue Passengers	Transfers Used	Total Rides	Per cent Rev of Total	Per cent Transf to Revenue
Chicago	1	445,562,120	318,245,723	763,807,843	58.35	71.60
Brooklyn	2	415,277,754	153,729,485	569,007,239	73.0	37.0
Philadelphia	3	¶367,478,473	65,405,780	432,884,253	84.89	17.79
Boston	4	281,008,471	.....	.....	*60.06	*65.00
St. Louis	5	221,443,845	104,601,771	326,045,616	67.95	47.20
Baltimore	7	145,601,990	57,030,556	202,632,546	71.90	39.15
PITTSBURGH	6	197,288,812	26,828,995	224,117,807	88.00	13.60
Cleveland	8	144,346,400	‡49,512,931	193,859,331	74.50	34.30
Buffalo	11	93,922,696	45,789,049	139,711,745	67.25	48.78
San Francisco	10	*94,595,079	*56,364,289	*152,431,145	*62.10	*59.56
Cincinnati	13	°88,334,477	°30,778,948	°119,113,425	°74.10	°34.85
Detroit	9	130,617,342	46,275,470	176,892,812	73.90	35.45
Milwaukee	12	90,235,653	29,328,724	119,564,377	75.50	32.50
New Orleans	14	78,643,680	17,816,746	96,460,426	81.55	22.66
Washington	..	.....	.....	.....	73.50	36.01
				Average	70.3	42.2

Note—*Year, 1907.
‡Pay transfers.
°Year 1908.
¶Including 13.25% exchange tickets @ 4c each.

In extent of passenger traffic, Pittsburgh ranks sixth both in regard to revenue and total passengers. Over 224,000,000 rides were registered during the past year as against 764,000,000 in Chicago, 326,000,000 in St. Louis and 203,000,000 in Baltimore.

Transfer Privileges. The last column of the above table shows that the cities differ very widely in the use of transfers; thus on the average about 42.2% of the revenue passengers use transfers, but in Philadelphia and Pittsburgh, only 14% to 18% avail themselves of this privilege—the least of all the cities—while in Baltimore nearly 40% and in Chicago over 70% use it. The comparison between Chicago and Pittsburgh is striking, and indicates that the transfer privilege in Pittsburgh is either not made use of, or else is so considerably restricted as to nullify in a large measure its advantages.

In Brooklyn, transfer traffic has increased since 1902 at about double the rate of increase in revenue passengers.

Some of the cities employ pay transfers, as in Philadelphia and Cleveland. This would tend to lower the transfer traffic to some extent, as in Philadelphia, to 14.3%. But on the other hand, Cleveland shows 34.3% transfers for the past year. St. Louis, Buffalo and San Francisco show a large volume of transfer traffic.

AVERAGE FARE.

	For all Passengers Carried	For Revenue Passengers Only
Chicago	2.895	4.97
Brooklyn	3.600	4.93
Philadelphia	3.945	4.51
Boston	*3.028	*4.998
St. Louis	3.350	4.93
Baltimore	‡3.560	‡4.952
PITTSBURGH	†4.313	†4.91
Cleveland	¶3.170	¶4.258
Buffalo	°3.618	°5.380
San Francisco	*3.087	*4.975
Cincinnati	3.662	4.94
Detroit	x3.452	x4.675
Milwaukee	‡3.528	‡4.678
New Orleans	.....	.....
Washington	3.17	4.31

Note—*Year 1907.
†For Calendar year, 1909.
‡For gross earnings.
¶Change of Fare in 1909.
°Interurban through fare counted as a unit.
xNot including chartered cars.

Two bases are in use for computing the average fare—1st, ratio of passenger earnings to revenue passengers, and 2nd, ratio of passenger earnings to total passengers, including transfers. The first may be termed average "revenue fare" and the second average "fare per ride." If a straight five cent fare is in general use, the first ratio will average well above 4.95c, but if certain pay transfers exist, as in Philadelphia and on the Pittsburgh inclines, the average revenue fare may be further diluted, as for instance to 4.5c in Philadelphia.

The average revenue fare is the real measure of the earning power, as it represents the *actual return* from each passenger *carried to his destination.* Average fare per ride is often cited as a measure of revenue, but manifestly the average revenue fare is the proper measure as it would not be directly affected by any number of transfers from point of origin to destination. Should the practice exist of giving transfers on transfers, the fare per ride would be reduced still lower, although the revenue fare would remain substantially the same.

Pittsburgh's average revenue fare is 4.91c—as very few tickets are sold at reduced rates, except pay transfers to inclines. A certain number of free tickets issued principally to employees,

are however counted as revenue passengers, but in both of these cases, the number is small. The Cleveland fare is exceptionally low by reason of the recent reorganization involving a fare less than five cents which took effect within the fiscal year reported. In cities having book or strip tickets, at a reduced rate, it appears that the major part of the earnings is taken in at the lower rate, resulting in a lower average revenue fare. Thus in Milwaukee and Indianapolis, selling six tickets for 25 cents or twenty-five tickets for $1.00, the ticket sales run as high as 80% of the total. *

Practice in the several cities varies with regard to the registration of fares in excess of five cents. In Pittsburgh each additional five cent suburban fare is computed as an extra passenger. Buffalo, on the other hand, registers any through interurban fare as a single passenger. This results in an average revenue fare above, instead of below five cents. Milwaukee registers a through interurban fare from the city as a single passenger. The average fare per ride is also affected to some extent, but the wide variations in this ratio shown in the table, are due to varying volume of transfer business.

*U. S. Census Report 1907.

PASSENGERS PER CAR MILE.

	Rank	Total Passengers per Revenue Car Mile
Chicago	2	8.91
Brooklyn	8	7.30
Philadelphia	12	°6.10
Boston	3	*8.63
St. Louis	4	8.43
Baltimore	6	7.47
PITTSBURGH	11	6.28
Cleveland	5	7.85
Buffalo	9	7.14
San Francisco	1	*12.03
Cincinnati	13	*5.77
Detroit	10	°6.72
Milwaukee	7	7.46
New Orleans	14	5.16
Washington	..	....

Note—*Year 1907.
°Basis of total car miles.

The ratio—"total passengers per car mile" is ordinarily taken as a measure of the standard of service and in comparing the service from day to day and from month to month on any one system, it is useful. But as this unit is affected by the size of the cars, by the varying riding habit of the passengers and by the transfer arrangements, it should not be taken too seriously in comparing one system with another. For instance, if there is a large interchange of passengers between the various lines of the system on account of a liberal transfer arrangement, as in Chicago, then the total number of passengers reported will be larger in proportion, as the transfer passengers are counted more than once.

The unit or ratio of "Revenue passengers per revenue car mile" is sometimes used for comparative purposes; but, as the income per car mile expresses practically the same information with the additional advantage of taking into account at the same time the average fare, this latter unit has not been shown in the comparative study.

EARNINGS PER MILE OF TRACK.

Total Operated Single Track	Rank	Gross Earnings
Chicago	2	$34,000
Brooklyn	1	34,500
Philadelphia	3	29,000
Boston	4	29,370
St. Louis	8	*24,400
Baltimore	11	*17,990
PITTSBURGH	12	17,090
Cleveland	7	24,450
Buffalo	14	13,880
San Francisco	5	*28,850
Cincinnati	9	†21,530
Detroit	13	15,770
Milwaukee	15	*11,870
New Orleans	10	†20,750
Washington	6	28,110
Average		27,363

Note—*For through track only.
†For total earnings.

Earnings expressed in terms of track mileage measures the combined density and riding habit of the population tributary to the railway lines. The cities listed vary from $12,000 in Milwaukee to $34,500 in Brooklyn, averaging about $27,000 per mile. This ratio also is affected by the amount of interurban track operated. Thus Pittsburgh, Buffalo, Detroit and Milwaukee are relatively lower in earnings per mile as compared with such cities as St. Louis, San Francisco and Cleveland, where there are few outlying lines. It is usually impossible to separate interurban from city earnings. In Detroit, however, the earnings for the five-cent fare zone which approximates the city limits, are about $23,000 per mile, but less than $16,000, including the interurban system.

Pittsburgh ranks twelfth—$17,090 per mile, practically the same as Baltimore. For the surface railway alone, Chicago earns nearly twice as much as Pittsburgh and exceeds Boston and Philadelphia with their Rapid Transit systems included.

ANNUAL CAR MILES PER MILE OF TRACK.

	Rank	Revenue Car Miles per Mile Total Single Track
Chicago	1	128,800
Brooklyn	2	128,500
Philadelphia	3	°113,000
Boston	4	105,200
St. Louis	8	85,400
Baltimore	9	67,700
PITTSBURGH	11	61,450
Cleveland	5	95,400
Buffalo	12	52,250
San Francisco	13	*48,120
Cincinnati	7	*94,200
Detroit	10	°65,310
Milwaukee	14	†45,100
New Orleans	6	94,700
Washington	..	.....
Average		86,271

Note—*Year 1907.
†For through track only.
°Basis of total car miles

This ratio is a measure of the average density of car service, that is the number of car miles per mile of track per year and is inversely proportional to the average time interval or headway between cars.

For instance, if a one-minute headway was to be maintained over the entire system for 18 hours each day for 365 days in a year, the measure of the activity of the line would be 365 x 18 x 60 or 394,200 car miles per mile of track per year. This figure is independent of the average speed of the cars. If the number of car miles actually reported for any system are divided into 394,200, then the average headway for an 18 hour day can be determined at once.

The above table shows an average of 86,271 car miles per mile of track per year for the cities listed, which would mean an average headway of 394200÷86271 or 4½ minutes on the basis of 18 hours operation each day.

It will be noticed that Chicago uses its tracks to the best advantage, having 128,800 car miles per mile of track per year, while Milwaukee shows the least density of car service and Pittsburgh is considerably below the average.

CARS PER MILE OF TRACK.

	Rank	Total Passenger Cars per Mile Total Single Track
Chicago	6	4.85
Brooklyn	3	5.70
Philadelphia	4	5.48
Boston	1	7.12
St. Louis	12	‡2.67
Baltimore	7	*4.72
PITTSBURGH	10	2.84
Cleveland	8	3.29
Buffalo	13	2.47
San Francisco	14	*2.43
Cincinnati	5	5.42
Detroit	11	‡2.71
Milwaukee	15	*1.48
New Orleans	9	2.88
Washington	2	°6.06

Note—‡Year 1907.
*For main through track only.
°Including Wash. Ry. and Elec. Co.—Capital Traction only, 6.15.

This ratio is an indirect measure of the frequency of service along the right of way. It varies from 7.1 cars per mile in Boston to 1.5 in Milwaukee. If all were in service, as for example during rush hours, the Boston density is equivalent to one car every 740 feet of single track. Pittsburgh operates 2.84 cars per mile, evidently below the average; however interurban mileage must be here taken into consideration as less frequent service is required. This is notably the case in Buffalo and Milwaukee, and Detroit.

In making this comparison it must be remembered that the relative number of miles of interurban track affect the results as the comparatively infrequent service on such lines will reduce the average to a considerable extent.

ANNUAL EARNINGS PER CAR.

	Rank	Gross Earnings from Operation per Passenger Car
Chicago	6	$7,015
Brooklyn	8	6,050
Philadelphia	10	5,300
Boston	12	4,120
St. Louis	3	7,900
Baltimore	14	3,810
PITTSBURGH	7	6,770
Cleveland	4	7,445
Buffalo	9	5,612
San Francisco	1	11,890
Cincinnati	13	†3,971
Detroit	11	‡5,102
Milwaukee	2	7,995
New Orleans	5	†7,260
Washington	..	....
Average		5,818

Note—‡Year 1907.
†For Total earnings.

The annual earnings per car is of importance, but is not necessarily a measure of service, as comparatively large earnings per car might result from either overcrowding, which would mean poor service, or from a large annual car mileage per car which would mean good service.

The average earnings for all the systems listed are $5818 per car per year, and the range appears to be from $3810 in Baltimore to $11890 in San Francisco, Pittsburgh's record being $6770 per car, or somewhat above the average.

Like other data based upon the car as a unit, this ratio is affected by the size of the cars and the proportionate amount of service supplied by each of the various sizes of cars making up the total car equipment of each system.

ANNUAL CAR MILES PER CAR.

	Rank	Revenue Car Miles per Car per Year
Chicago	5	26,570
Brooklyn	6	22,540
Philadelphia	9	°21,340
Boston	13	14,760
St. Louis	4	27,670
Baltimore	14	14,340
PITTSBURGH	**8**	21,600
Cleveland	3	28,960
Buffalo	10	21,120
San Francisco	11	*20,380
Cincinnati	12	*18,180
Detroit	7	*22,200
Milwaukee	2	30,320
New Orleans	1	33,100
Washington	--	.....

Note—*Year 1907.
°Year 1909, basis total car miles.

The measure of the activity of the car equipment is the record of the number of car miles operated by each car per year. If a car could be operated for 18 hours and 365 days in the year at an average speed of 9 miles per hour, it would have a record at the end of the year of 18 x 365 x 9 or 59,130 car miles. In practice, however, cars must be withdrawn for repairs, and only part of the equipment is required for service during non-rush hours, so that the actual record of car miles will fall considerably below the possible total. In addition, many systems substitute open cars for many of their closed cars in the summer months, and this practice would considerably reduce the average car mileage per car. The figures in the table, however, show the actual reported results which range from 33,100 annual car miles per car with the New Orleans system to 14,340 car miles per car with the Baltimore railways. Pittsburgh is about the average, with a record of 21,600 car miles per car per year.

LENGTH OF CAR TRAVEL.

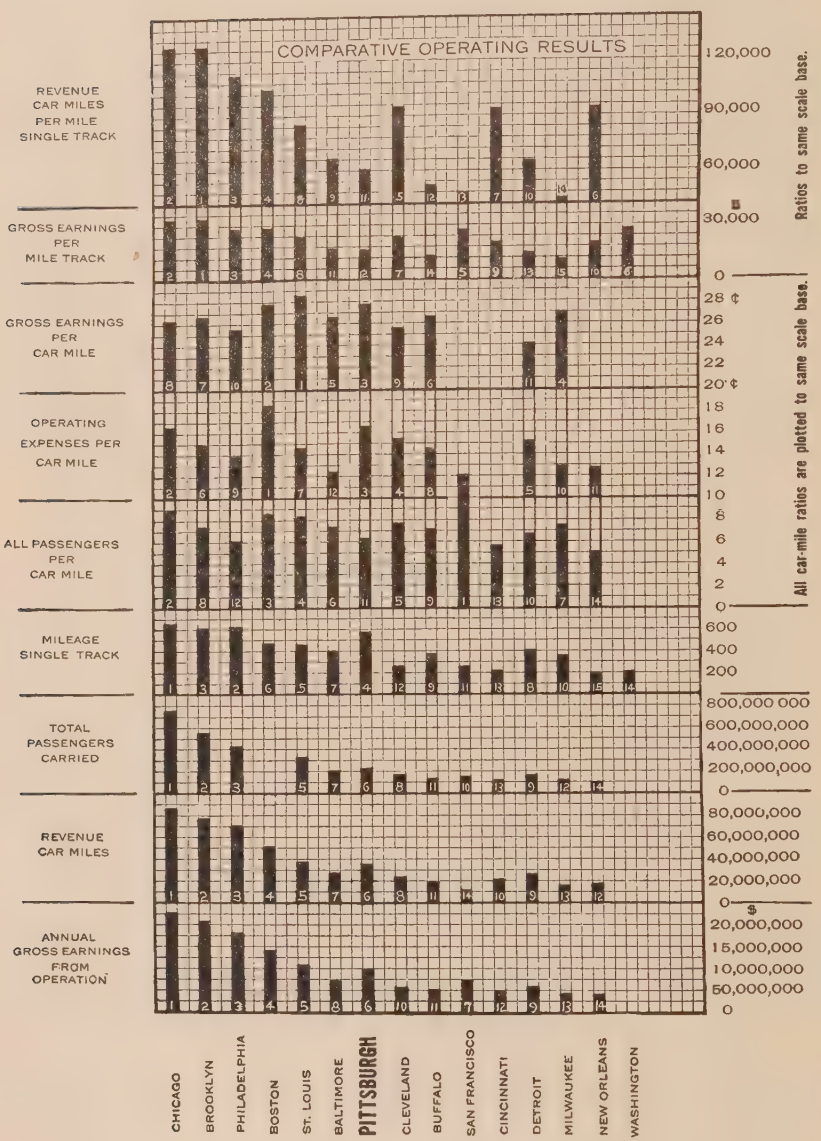
An important factor in comparisons between cities of different dimensions is the relative length of car travel. This factor shows the averge length of trip in miles traversed by the cars on the various routes comprising the system. The figure is obtained by dividing the aggregate car mileage by the total number of single trip runs. It will be seen that this is not an arithmetical average of the trip lengths of the various routes, but represents the true average of the system, i. e. both long and short routes are accorded proper representation or weight in the general average by summing up the totals rather than averaging the individual trip lengths.

	Aggregate Car Miles Run	Total Round Trips	Average Length Round Trip Miles	Average Length Single Trip Miles
PITTSBURGH RAILWAYS CO. (5c. zone)				
111 Single routes	27,009,445	2,633,231	10.26	5.13
Maximum *				8.49
Minimum				0.63
CHICAGO RAILWAYS CO.				
46 Single routes	40,707,077	3,701,470	10.99	5.49
7 Through routes	4,009,691	170,530	23.50	11.75
TOTAL	44,716,768	3,872,000	11.55	5.78
Maximum one way through route				17.72
Minimum " " "				7.50
Maximum one way single route				8.71
Minimum " " "				0.92

*Longest haul within 5c zone, Bellevue-Westview Loop, extends outside City Limits. See Map Comparison of Cities, page 122-3.

These results indicate that the average length of a car travel in Pittsburgh—5.13 miles—is not greatly different from that of Chicago —5.78 miles—where city boundaries are much further from the business center. In this connection the comparative map of city traction areas accompanying this chapter will be of interest. The Chicago results, to be sure, are confined to the lines operating in the North and West Sides only, but as both of the principal Chicago Railway systems cover a territory radiating from the business center, the data from the Chicago Railways Company may be taken as generally indicative of conditions existing in that city.

Considering the greater dimensions of the western city it would appear that in Pittsburgh there should be a possibility of reducing car travel by the establishment of short haul routes, either on the inner loop principal or by means of transverse routes. Comparatively few such routes exist in the present scheme.



COMPARATIVE OPERATING RESULTS OF LARGE URBAN TRACTION SYSTEMS.

Summary of Comparative Results.

In the foregoing exhibits, the traction results from the various cities have been shown in detail. Compared intelligently and with proper reservation, as noted at the beginning of this chapter, general impressions gained by other observations may be made more definite. In these comparisons, both total quantities and ratios have been used, the one conveying an idea of the size or extent of the traction operations, the other, reducing the data to the same basis irrespective of size. Thus these ratios may be regarded as measures or indices of density, service, crowding, activity in the use of equipment, etc.

The diagram on the opposite page recapitulates at a glance the more important relations of the foregoing tables exclusive of the financial results shown by the first diagram of this chapter.

The four lower groups of ordinates record total quantities; the remaining groups above show ratios between these quantities. Note that all the car mile ratios are plotted from the same base line, likewise the ratios per mile of track. The figures opposite each city record its respective rank.

Studying the quantity records, it may be seen that Pittsburgh ranks sixth among the cities in earnings, car miles and passenger traffic, but ranks relatively higher—4th—in track mileage. This impression of an expanded system is reflected again in the fact that Pittsburgh ranks low—11th or 12th—in car miles and earnings per mile of track.

Turning to the car mile records which are rendered somewhat uncertain by varying practice in counting transfers and computing car mileage, Pittsburgh ranks high—3rd—in earnings and expenses per car mile, but low—11th—in passengers per car mile. This seeming discrepancy is largely explained by the fact that Pittsburgh gives few transfers In other cities revenue passengers are recounted more times than in Pittsburgh,—in Chicago as high as 58% more. All the car mile ratios from Pittsburgh are influenced by the fact that trailers are counted as full car mileage.

In conclusion these comparative results may be summarized in the following order: Extent of System, Service Rendered leading up to the fundamental—Financial return.

In extent, the Pittsburgh system may be said to be relatively overexpanded as compared to larger or more densely settled cities. This necessarily reflects in a less density of

patronage, and lower earning capacity per mile of road, indicating plenty of opportunity for cultivation of traffic along the lines already constructed.

Similarly, the density and frequency of service is adversely affected by this patronage being spread out over a large area. However, decided efforts have been made to maintain income per car mile at a high point, which can hardly be done under such conditions without economizing service. Many other cities excel Pittsburgh in activity of equipment, i. e. annual mileage per car. Conversely this is reflected in the relatively high unit earnings per car mile and per car.

Transfer arrangements in Pittsburgh are extremely curtailed resulting in a lower total passenger traffic than would be expected, and also a fictitiously low factor of crowding,—passengers per car mile. However the maximum fare is maintained with relatively few concessions below five cents.

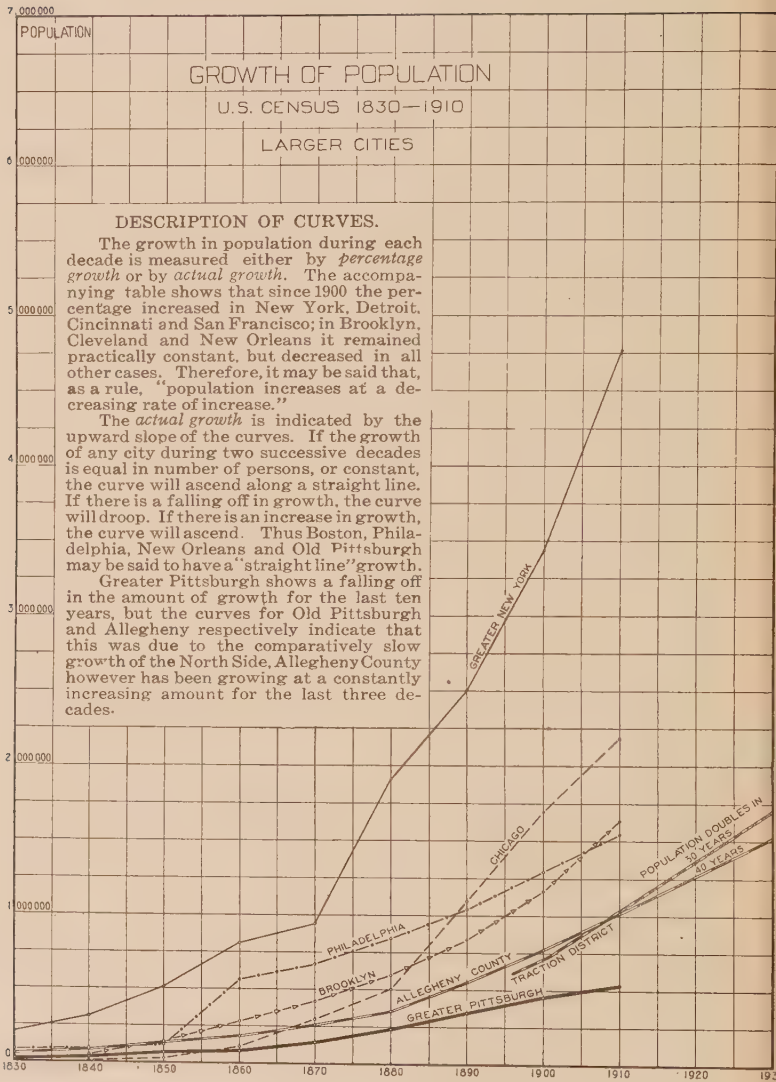
In final return to the Company, Pittsburgh is evidently attempting the impossible under present conditions of traffic, service and income owing to the excessive burden of fixed charges. Operating ratios for the important cities average out about the same as Pittsburgh, but including taxes and depreciation, Pittsburgh is somewhat below the average. However, if the deficit incurred be disregarded, then the Pittsburgh system would appear to be in a fairly favorable position.

These figures naturally suggest the necessity of building up of earnings by cultivating the "riding habit," the possibilities of saving in maintenance and power costs and the probable benefit of a more liberal transfer policy, for as compared to other cities, Pittsburgh's system has plenty of track but is lacking in car equipment and patronage.

In the comparison of the length of car travel in Chicago and Pittsburgh are revealed two opposite tendencies referred to elsewhere in the report. Although a much smaller city, Pittsburgh has had to reach out further for its income occasioning the comparatively long haul noted. Had its density of traffic increased sufficiently, this long haul, of course, would have been justified and perhaps in addition, many through routes, as in Chicago. But on the other hand, there should have been a consistent tendency toward contraction by means of short haul routes to better serve the growing density nearer the business center. The expansion has been a necessity and very desirable,

but the contraction has been neglected. Thus in order to compensate for the geographic disparity with other cities, Pittsburgh must give more attention to this feature -short haul.

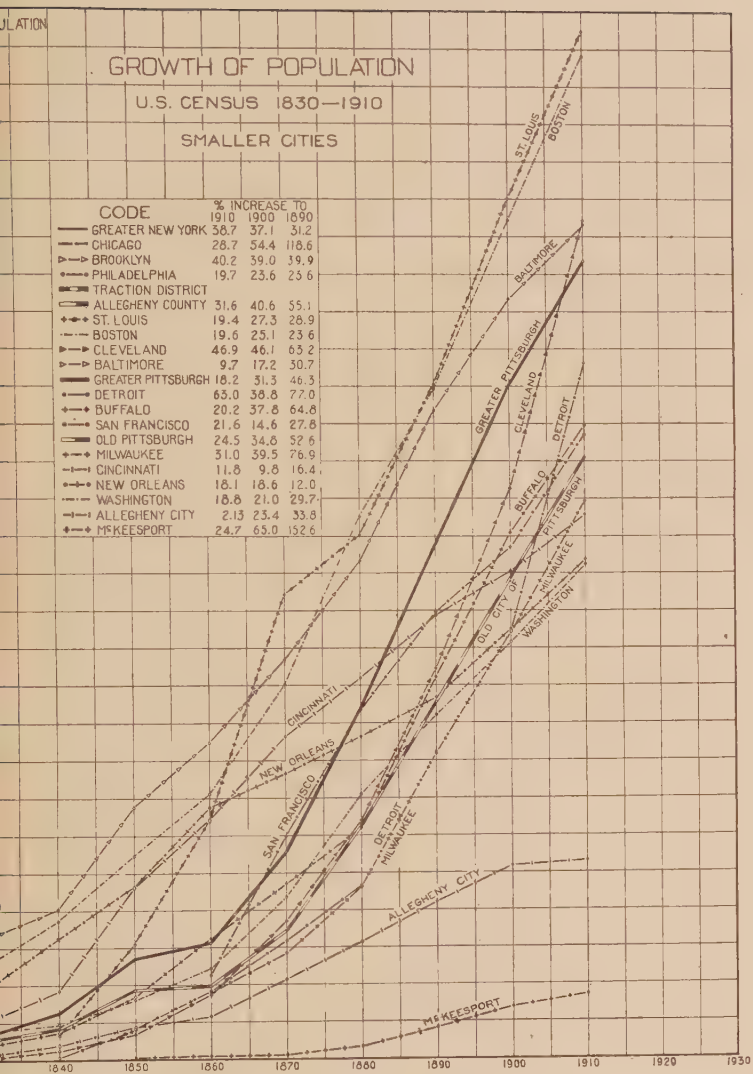
Finally, the study of growth of earnings with population shows that the possibilities of the Pittsburgh District are potential and it is only a reasonable conclusion from all the data at hand that the earnings per capita can be materially increased by constantly improving the service, as has been demonstrated in other cities.


POPULATION
GROWTH OF POPULATION
U.S. CENSUS 1830—1910
LARGER CITIES
DESCRIPTION OF CURVES.
The growth in population during each decade is measured either by *percentage growth* or by *actual growth*. The accompanying table shows that since 1900 the percentage increased in New York, Detroit, Cincinnati and San Francisco; in Brooklyn, Cleveland and New Orleans it remained practically constant, but decreased in all other cases. Therefore, it may be said that, as a rule, "population increases at a decreasing rate of increase."
The *actual growth* is indicated by the upward slope of the curves. If the growth of any city during two successive decades is equal in number of persons, or constant, the curve will ascend along a straight line. If there is a falling off in growth, the curve will droop. If there is an increase in growth, the curve will ascend. Thus Boston, Philadelphia, New Orleans and Old Pittsburgh may be said to have a "straight line" growth.
Greater Pittsburgh shows a falling off in the amount of growth for the last ten years, but the curves for Old Pittsburgh and Allegheny respectively indicate that this was due to the comparatively slow growth of the North Side, Allegheny County however has been growing at a constantly increasing amount for the last three decades.
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
GREATER NEW YORK
CHICAGO
PHILADELPHIA
BROOKLYN
ALLEGHENY COUNTY
TRACTION DISTRICT
GREATER PITTSBURGH
POPULATION DOUBLES IN
50 YEARS
40 YEARS
1830
1840
1850
1860
1870
1880
1890
1900
1910
1920

GROWTH OF POPULATION OF AMERICAN C

These curves record the population of the first fifteen cities of the Un and the Pittsburgh Traction District. With the exception of the District F successive annexations in the various cities. This is partly responsible f which annexed a large territory in 1889, thus causing an abrupt rise in the p

The population of the Traction District is now approximately one account of the extensions of the trolley system into new territory, the popul of the county. Judging therefore from past experience, it is reasonable to time, while the county will increase from 1,000,000 to 2,000,000 population i



AND OF PITTSBURGH TRACTION DISTRICT.

es for successive decades, as compared with Pittsburgh, Allegheny county
n, the curves are based on the United States Census returns and include
of the irregularities in the curves, as for example in the case of Chicago,
n curve.

people, which is also about the population of Allegheny county—but on
ved by the traction system has been increasing faster than the population
that the Traction District will double in population within about 30 years
40 years, or by 1950.

RELATION BETWEEN GROWTH OF POPULATION AND EARNINGS.

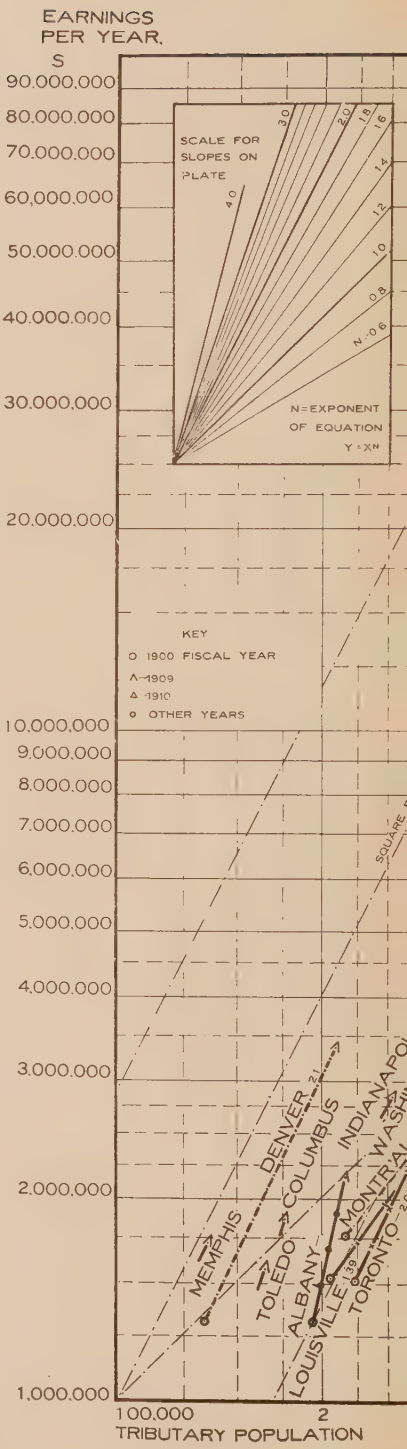
As population grows, do traction earnings increase at the same or a faster rate?

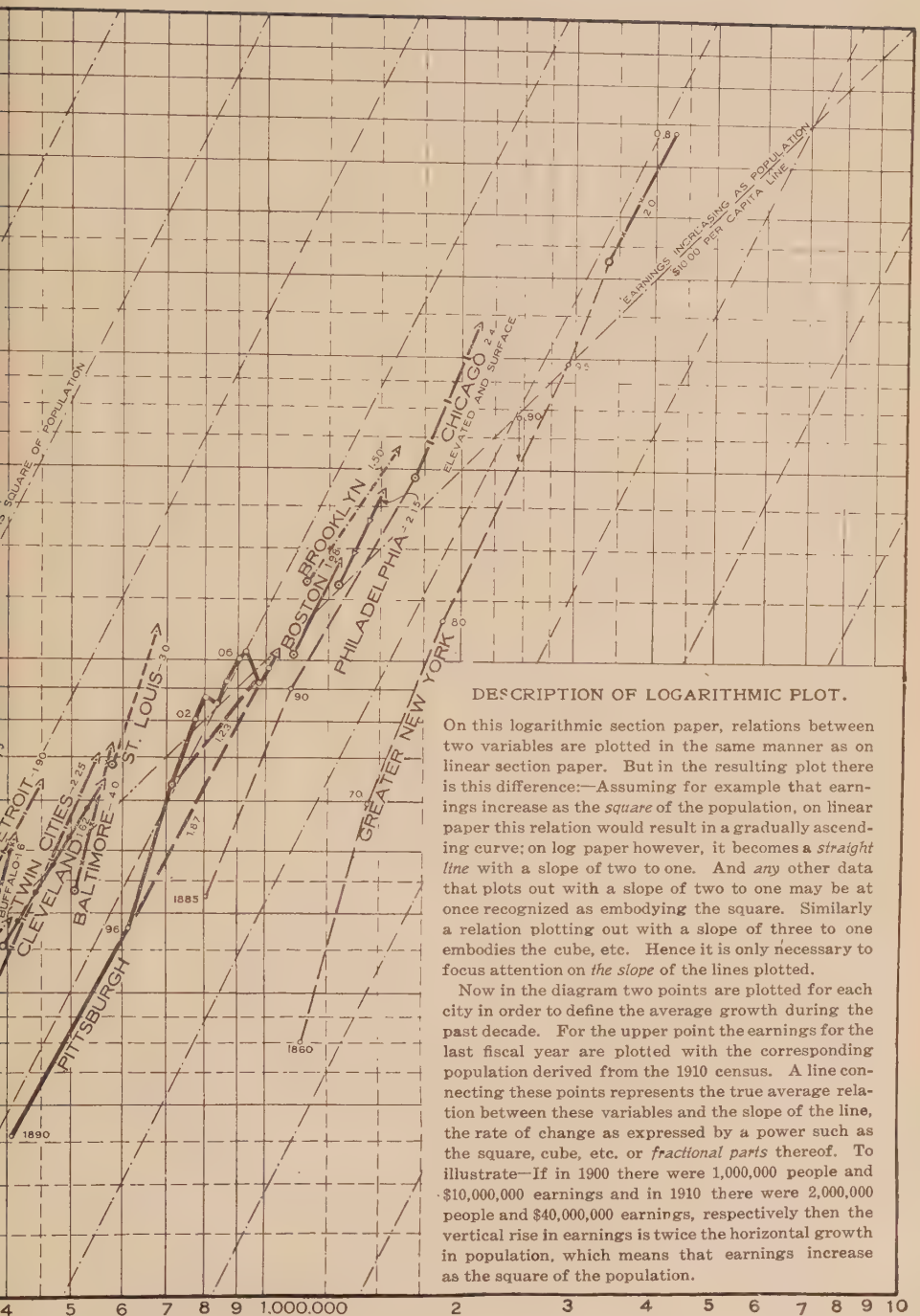
A study of the relative growth of population and of transit earnings of the large American cities during the past ten years shows some surprising results and points to the conclusion (indicated in the accompanying diagram), that *as a rule, the earnings from local transportation increase as the square of the population.* If this statement is correct, it means that when the population of the average community doubles, then the earnings from transportation may be expected to increase four fold, provided that the transit facilities keep pace with the demand.

For comparative purposes, the actual relation between population and earnings in each of the large cities can best be shown graphically on logarithmic section paper, as described in detail thereon. Opposite the name of each city is given the index number or power representing the relative rate of growth. It should be remembered that as the index number is greater or less than two (2.0) the earnings have increased at a greater or lesser rate than the square of the population.

The record in Pittsburgh for the past ten or fifteen years is erratic, due to several causes. The surface system has been extended rapidly into outlying territory, and the business depressions have been particularly felt in this District, but on the other hand in years of prosperity, the earnings have increased much more rapidly than at the average rate. For instance, counting on this rule of the square, the earnings this year should increase over the last fiscal year by about $625,000, while the present actual income is at the rate of about $800,000. According to this it will be safe to estimate the earnings from the surface system as increasing with the square of the growth in population *for the next few years.* Whether or not the amount of money to be expended for transportation in the Pittsburgh District will continue to increase at the same rate must, of course, depend on the continued prosperity of the District and upon the rapid transit facilities which may be provided.

This analysis is confined to the past decade. During the previous decade electrification of horse and cable railways took place which rendered the results not comparable owing to the different operating conditions.





DESCRIPTION OF LOGARITHMIC PLOT.

On this logarithmic section paper, relations between two variables are plotted in the same manner as on linear section paper. But in the resulting plot there is this difference:—Assuming for example that earnings increase as the *square* of the population, on linear paper this relation would result in a gradually ascending curve; on log paper however, it becomes a *straight line* with a slope of two to one. And *any* other data that plots out with a slope of two to one may be at once recognized as embodying the square. Similarly a relation plotting out with a slope of three to one embodies the cube, etc. Hence it is only necessary to focus attention on *the slope* of the lines plotted.

Now in the diagram two points are plotted for each city in order to define the average growth during the past decade. For the upper point the earnings for the last fiscal year are plotted with the corresponding population derived from the 1910 census. A line connecting these points represents the true average relation between these variables and the slope of the line, the rate of change as expressed by a power such as the square, cube, etc. or *fractional parts* thereof. To illustrate—If in 1900 there were 1,000,000 people and $10,000,000 earnings and in 1910 there were 2,000,000 people and $40,000,000 earnings, respectively then the vertical rise in earnings is twice the horizontal growth in population, which means that earnings increase as the square of the population.

CITY PLANNING AND TRANSPORTATION.

Urging the recognition of transportation as a vital factor of city growth,—Opposing tendencies of expansion and contraction, —Intercommunication between natural centers the key to progress,—Necessity of a City Plan for the future,—Important questions discussed: Present service, Future equipment, Through routes, Transfers, Rapid transit, Financial policy, Zone system, Competition,—Necessity of constant extension,—Complete public control essential to future City Plan,—Legislation necessary.

Cities and Districts grow according to natural laws. It has only been within recent years however, that these laws have been studied in this country in such a way as to lead to the understanding of the science of City Planning. But there is now a decided tendency in many cities to substitute intelligent foresight for the previous policy of a hap-hazard development with its natural consequences of paying for improvements at the expense of experience.

Expansion and Contraction.

A study of urban communities shows that they develop according to the laws of both expansion and contraction. The tendency is always to spread out from the origin, and at the same time there is a reflex action toward congestion at the center of the city. Modern transportation methods have revolutionized the social conditions and economic laws of urban life in such a way that both of these conflicting tendencies of axial growth and central congestion have been accentuated. This continual spreading out of the community makes the problems of providing and maintaining such municipal improvements as streets, pavement, sewerage and water, as well as police and fire protection more and more difficult. On the other hand, the movement of a large part of the population to and from the business center on each work day results in congested thoroughfares and crowded downtown streets. City re-planning must recognize the constantly increasing demands for both country life and city apartments, for both spread-out factory districts and downtown skyscrapers, as the modern city must be the resultant of these conflicting developments.

Development of Centers.

The life of a community appears to crystallize about natural centers. There will be centers of business and trade, wholesale and retail districts, central points for amusement and education, park and playground areas for rest and recreation, terminals for freight and passenger traffic, and sections devoted to warehouses and factories, while in between these sections or beyond them will be found the residence communities. The transportation problem consists in providing and maintaining the most direct, rapid, comfortable and economic system of communication between these centers and the homes of the people. And in proportion as these systems of intercommunication are designed to supply the demands for transportation during the rush hour periods without too great an overstrain, will the centers of business and recreation develop and the prosperity and happiness of the community grow.

Intercommunication Between Centers.

This traffic between the centers of a community develops along natural lines, which, when well located, should be encouraged and perpetuated. It is being found that that city or district which has its main arteries located on diagonal lines has a more natural and convenient design than the one using the rectangular system of streets and highways. The centers of a District should therefore be interconnected by a system of "radials and circuits" and the corresponding transportation system should provide the easiest means for reaching each center, for passing directly through that center, or of avoiding it entirely by a convenient by-pass route. The social and commercial advantages of the District will be the more or less ideal in proportion to the fusion which is secured between the various component parts of the community by means of its systems of intercommunication.

City Plan for Pittsburgh.

In preparing this report upon the Transportation Problem of Pittsburgh, there have been kept in mind the larger problems of City and District Planning with which the proper arrangement of the transit facilities is seen to be so intimately and vitally connected.

As indicated in the letter authorizing this report, there has already been prepared a preliminary report on "City Planning for Pittsburgh" in which the subject of Electric Railroads was given prominent place. The preliminary report was made to the Pittsburgh Civic Commission, and in order to show the sequence between that report and the present one, it has

been thought best to repeat and answer those questions of the Civic Commission's study having to do with *Electric Railroads*, as follows.

1. How much better service can the Pittsburgh Railways Company afford to give at once?

A very decided improvement in service can be secured without any material addition to present operating expenses by re-arranging the present distribution of cars throughout the day on the various routes, by keeping the cars up to schedule and by re-routing the entire system, both to provide through routes and to take advantage of the transfer principle. It is difficult to express these changes in percentage of improvement, but with the additions to equipment which the current increase in patronage will justify, the car service can and should be improved until it will be reasonably adequate. This improvement will in turn result in additional business so that eventually the company will have the increased earnings it needs, and the public will have the adequate service it has the right to expect. Viewed from this standpoint, the company can hardly afford to economize its service, for the possibility of cultivating the riding habit by furnishing good service is an opportunity which should not be longer overlooked. The great increase in the receipts per capita per annum without great comparative increase in the population in Albany, St. Louis, Chicago and some other American cities are potent examples of the benefits realized from close attention to the improvement of service.*

2. What equipment should be provided for a service which should increase with growing demands in order to secure safety, reasonable comfort and maximum capacity?

In the first place, the *present equipment* of tracks, cars, power plants, car shops and storage houses, feeder system, returns, etc. *should be thoroughly rehabilitated.* The expenditure for this purpose should amount to fully $10,000,000.

Future renewals of equipment should be provided for out of earnings at the rate of at least $1,000,000 per year, which means an annual depreciation fund for future obsolescence equal to about 10% of the gross earnings.

Equipment to provide for future extensions, betterments and improvements should be purchased at the rate of at least *$3.00 of new investment for each additional dollar of annual earnings.* As the earnings are at present increasing at the rate of about $800,000 per year, the new capital which should be available annually, should amount to at least $2,500,000.

*See insert diagram opposite page 140.

In order to protect its investments and at the same time furnish adequate service, the Railway Company should develop a financial plan which should provide for the above amounts for rehabilitation, depreciation and improvements.

3. What possibilities are there for through routes?

The decision upon through routes must depend upon the outcome of a co-operative effort between the City and the Company to rearrange the routes and to provide some new connections which would make re-routing of the entire system possible. There are many cases where through routes would be the most efficient plan, as it would result in reducing operating expenses, and by providing facilities for short haul riding, which are now lacking, would also increase the earnings. Through routes cannot be most effectively worked out *without additional tracks* and connections. New grants for these tracks apparently must depend upon the requirements and concessions involved in getting a fair arrangement all around for both future adequate service and a protected investment, so that the question of through routes cannot be determined separately, but depends upon the settlement of the entire question.

4. Will it be reasonable to expect universal transfers and one fare for the entire City?

It will be reasonable to expect "one City—one fare" and "a continuous ride in one direction with one transfer" provided a definite agreement can be reached as to how much of the income from passenger traffic is to be returned into the operation of the system in the form of service. Such an agreement would definitely fix the basis of adequate service, as a given income would practically dictate a corresponding number of car miles. If these car miles can be operated so as to produce satisfactory service, then there should be no necessity of collecting more than one fare for a ride from one part of the city to any other part—but if a trial under such an agreement should indicate that the car service was not sufficient, then the alternative of charging for certain transfers would be the natural result. Chicago now has through routes and practically universal transfers while Cleveland is passing through a trial period to determine the amount of fare to be charged, so that the suggestion of a trial of universal transfers cannot be considered unreasonable.

5. When will the density of the traffic justify the development of a subway, elevated road or other rapid transit system?

The construction and operation of rapid transit systems will *create* traffic, and on the other hand, the failure to provide improved facilities will hold back the development of a community. To strike just the proper balance which will not involve too large a development charge for non-paying operation on one hand or too great a lag of actual building behind the demand on the other hand, is one of the most important problems involved in rapid transit development.

There is no question that the tendency "to get out into the country" will tend to militate against the building of subways in Pittsburgh, but if the downtown terminal facilities of a subway system are properly combined with the rapid transit service of electrified suburban lines, then this tendency to move away from the congested centers can be made to contribute toward that density of traffic which will make rapid transit lines possible.

Assuming a continuous growth in population in the Pittsburgh District equal to the past record and further that the earnings from transportation will increase as the square of population, as has been demonstrated in nearly all large communities, then Pittsburgh should be ready for the completion of the first section of a subway system by the time that ordinarily has been taken in other cities to locate, plan, finance, build and equip a transit facility of this magnitude. In other words, the efforts to secure a subway system for Pittsburgh should be continuous, for the density of traffic which is naturally increasing added to the additional traffic which the subway system will create and attract will be sufficient to justify the investment in a subway system constructed along the lines advocated by the time this improvement can be culminated. To place the exact estimate upon the length of time it may take to promote and build a subway in Pittsburgh is as difficult as to prophesy exactly when Pittsburgh will be ready for this subway, but as an expression of opinion is asked, this period is put at about ten years from date or about 1920.

> *6. What should be the financial policy in promoting rapid transit? To build with private capital or city credit? To assess the cost on the districts benefitted? To anticipate needs and influence the character of the city's growth or to await developments and build to relieve congestion?*

Private capital will probably take more interest in promoting subways than if the enterprise is left to the City. The steam roads will be slow in adopting electrification unless encouraged by the possibility of securing a downtown subsurface terminal. The best solution at present, apparently, would be to encourage private capital to make its best offer for building the subways

on the basis of an indeterminate franchise, reserving the right to the City to purchase the system and to control the service. A fund to amortize the cost of construction out of earnings should be provided, and it should be understood that outlying surface lines and electrified steam roads could use the tracks in the subway by paying an equitable compensation. In the meantime legislation should be secured so that the City can lend its credit to the building of subways, and then the City will be in a position to make a good bargain for the subsurface rights or proceed to build the subway with its own money and lease it to some company for operation.

I have not had an opportunity to study the possibilities of assessing the cost of the subway in those portions of the District directly benefitted, but if the subway is used as suggested in connection with the electrified steam lines and the present trolley system, it will probably be impracticable to work out an equitable assessment under these circumstances.

If City Planning and Transportation developments are to go hand in hand, then the growth of the City and District should be anticipated by its transit facilities.

7. For comprehensive rapid transit which is better, through routes or loops? Universal five cent fare or zone system of fare? Train operation or single cars? Competition or a system of transfers between surface lines and rapid transit systems?

Through routes are as a rule better than loops in serving a community consisting of a business center connected with radiating outlying districts.

The zone system of fares is the practice almost universally adopted in Europe, but in America, our trolley systems have been developed largely by the use of a universal five cent fare. To change this practice and introduce a zone system of fares may be possible and even desirable, but not before the railway system has been brought under competent and efficient public control so that the public can be assured that it is receiving back in service a fair proportion of the passenger income.

Cars in trains will be found most efficient in connection with rapid transit lines such as subways and electrified steam lines, as train operation in the only way to develop sufficient car mile capacity to justify the investment in such lines.

Competition in connection with public utilities is now generally recognized as a poor civic policy. The duplication of equipment and of management in serving any District with trans-

portation should be avoided, and where one system can be operated more efficiently than another, then a plan of transfers should be worked out in such a way that each system can be operated at its most efficient density. This can be done in Pittsburgh by developing the comprehensive plan for transportation in such a way that the surface trolley system will be used in collecting and distributing passengers in a more or less local way, while longer haul patrons will be furnished with rapid transit by electrified steam lines using the subway for interconnections through the downtown district, and this entire system should be tied together by a convenient transfer arrangement.

Constant Growth Necessary.

A Community or District may be said to resemble a living organism. "That such a conception is popularly held is shown by the common phrases, the "heart" of the city representing the business center, the "arteries" of traffic representing the streets, the "lungs" of the city representing the parks, and to carry the simile further, the railroad depots and wharves may be called the "mouths" through which the city is fed and the telephone and telegraph lines its "nervous system."*"

Like all living organisms, growth must be continuous or decay will begin. Further it has been found that the larger the City, the greater is the activity of its individual units. The demand for transportation increases about as the square of the population. Property values also increase at a much faster rate than does the population, and it is a question whether or not the expenditure of money for municipal purposes and improvements should not increase by at least the square of the population. Taxation for municipal purposes depends on land values and land values are seriously affected by good or bad transportation facilities. The total amount of money expended for transportation is about equal in amount to that collected for taxes. Transportation, therefore is not only equally as important as all other municipal problems, but it directly controls the amount that can be expended for civic improvements.

City Plan Depends Upon Public Control.

There can be no "city plan" without a comprehensive transportation policy—in fact, it might be reasoned that the transit facilities should be planned first.

*—R. M. Hurd in "Principles of City Land Values."

There can be no transportation plan unless there is an effective control of the transit developments, and there will be no grasp of the situation until this control has been established in such a way as to fulfill the following requirements:

1. This control should be based upon the principles of 1st securing adequate service and of 2nd, the establishment of a rate of fare which will protect actual investment Urban transportation is a natural monopoly—investment in an established system which suitably covers a territory should therefore be secure from competition, but only at the price of insured good service.

2. This control should be comprehensive enough to cover the entire Pittsburgh District—should have sufficient power to lay out a general plan for the entire community and be charged with the responsibility of the details of development.

3. This control should issue permits for extensions, pass upon the financial arrangements for future betterments and additions, approve the technical details of rehabilitation and improvements, supervise the operation of the system including the wages of officers and employees and audit the record of results.

4. This control should be authorized to specify the rate of return on the actual investment, the basis of the value of the transportation property, the rates of fare to be charged, and the amount of funds to be set aside for insurance, damages, depreciation, taxes and operating reserve.

5. This control should be a public tribunal for the hearing of complaints, for the investigation and prevention of accidents and for anticipating the wants and adjusting the demands of the community for a well-balanced, modern, safe, comfortable, efficient and adequate transportation system.

6. This control should adjust the taxation, license fees, paving and street cleaning requirements for the reason that all burdens of this character *reduce* the amount of service that can be secured for a given fare.

7. This control should have sufficient power to bring about a combination of surface and subsurface facilities with the existing steam or electric suburban lines so as to produce a comprehensive system of transportation for the entire District.

8. This control should approve (before submission to a referendum vote of the community) the issuing of self-supporting bonds for the securing of money for the building or buying of subways and eventually for the purchase of surface lines. This power to purchase is advisible as an assurance of continuous good service but it should not be exercised until it is evident that a material saving in fixed charges can be effected by using the City's ability to borrow at a lower rate of interest and after some means have been devised of placing the spending of the money and the operation of the road beyond the influence of corrupt politics.

9. This control should be authorized to decide what extensions should be made and operated at a loss at the expense of the entire system and of the community, and what additions should be provided only on the basis of an assessment on the districts directly benefitted.

Complete Public Control Essential.

The vital importance to the growth and general prosperity of the District of defining and securing authority for some system of centralized and effective control of the transit situation cannot be overestimated. The conditions of the tracks and the inadequacy of the equipment of the present system, and the evident lack of a policy for future developments are sufficient reasons for the adoption of such a plan.

The working out of an effective plan is a task in which each citizen of the community can and should take a part. The final transportation arrangements for the District, and therefore its desirability as a place of residence and business will depend upon the measure of interest, intelligence and activity with which its individual citizens give the subject attention.

Legislation which will secure for the District the complete control of its public utilities, in such a way that private privileges will not be allowed to seriously interfere with the growth and prosperity of the community is the next most important step in solving the problem of transportation which is so fundamental to the progress of the entire Pittsburgh District.

APPENDICES.

THE RE-ROUTING PROBLEM

Emphasizing the importance of a logical, comprehensive plan for the entire District—Co-operation between the City and the Company essential—Present service—Steps necessary to evolve a satisfactory re-routing—Basic data required—General principles of routing—Service to be measured by income available—Routing problem must receive continuous study and co-operation for changes to be permanently effective.

Fully as important as the development of a comprehensive plan for the rehabilitation and improvement of the physical plant of the system is the question as to how, when and where to run the cars. This is a problem of such far-reaching importance that it should not, in fact, cannot be satisfactorily settled by any one man. The President of the Railways Company or his officials cannot alone make the decisions without exposing themselves to criticism; and the service cannot be successfully regulated by any representative of the City without the co-operation of the Railways Company. *The problem, therefore, is one that should be worked out by means of an official conference;* and until the fundamental principles of re-routing have been determined and an equitable balance between the various interests has been established in such a way that the balance can be maintained, there can be little real progress made towards securing adequate service by means of re-routing.

Present Service.

The present routing is far from satisfactory. Some sections of the city are getting better service than other sections; many routes which should be served with double truck cars are still being operated with the small single truck cars, and excessive over-crowding at certain times of the day exists on some lines, while, on the other hand, there are empty seats which are being run unnecessarily at other times and places.

The whole system of routing is the result of more or less haphazard development rather than the outcome of a careful design. The growth has been influenced to a certain extent by special interests, which have been favored, not so much on account of influence as through insistence, until *the entire routing system may be said to be out of balance.*

To Improve the Routing on a permanent basis, the following steps are suggested:

1. Determine the relation that should exist between Income and Service by agreeing that a certain percentage of the gross earnings from operation shall be used in giving service; the balance to be retained by the Company for fixed charges and profits.

2. Study the requirements of each section of the City and District and the physical difficulties to be contended with.

3. Establish the principles of routing that will result in the most economical distribution of the car miles available with a given income.

4. Provide a system for the recording and the checking of schedules, delays and accidents. These records should be constantly used for improving the service and should be public.

5. Make provision for extending and altering the tracks and routes to take care of constantly growing and shifting demands.

It will be decidedly ineffective work to approach the rerouting part of the transportation problem without an equipment for securing the information needed as well as a definite understanding that a comprehensive plan is to be developed, which will be acceptable to and accepted by the majority of interests affected.

Data Required for Routing Problem.

Any rearrangement of routes, to be of permanent benefit, must be based on facts and not on assumptions. Among the records which should be available to those charged with the responsibility of working out an improved schedule are the following:

1. *Monthly Records* of the number of Passengers, number of Car Miles and Earnings per Car Mile on each route for several past years.

2. *Continuous Daily Records* showing the earnings of each car on each route, the total number of passengers carried by each car and the actual time of each trip as compared to the scheduled time.

3. *The Physical Limitations* of each route showing length of line, curves, width of streets, obstructions at corners, distance between tracks, overhead obstructions, grades, terminal facilities and connections with other routes.

4. *The Present Schedule* showing the number of cars scheduled at different times of the day for summer and winter service, and the time required for each run during rush hours and non-rush hours.

5. *The Location of Car Houses and Storage Tracks* and a statement of the dead mileage which the present arrangement entails in running empty cars to and from the ends of their routes when placed in or taken out of service.

6. *Records of Counts* of Passengers and Seats which have been made from time to time by the City and by the Company at various checking stations.

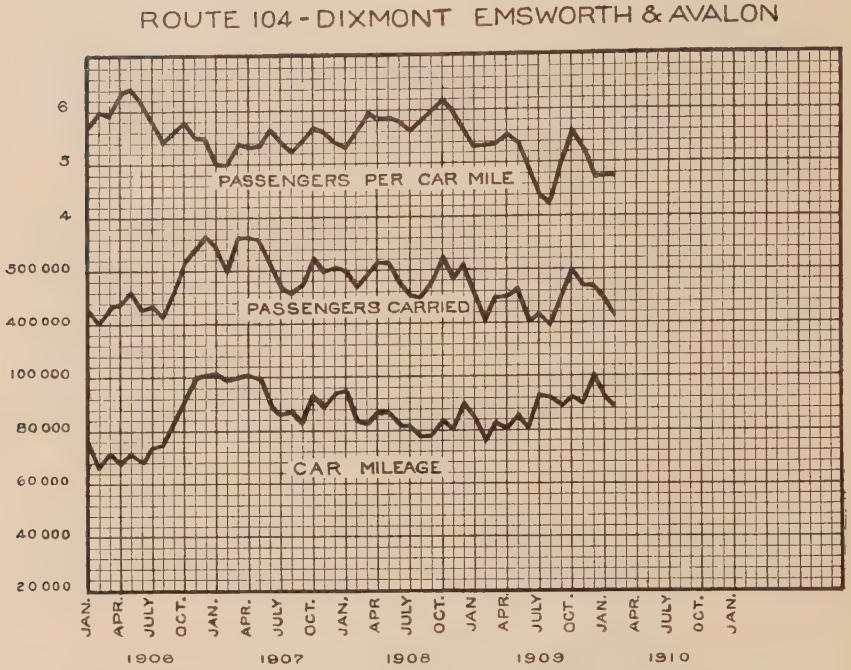
7. *Records of Individual Car Trips* which have been made and which ought to be made to ascertain when the passengers board the car, how far they travel and when they alight, and the ratio between the maximum number of passengers using the car on a given one-way trip and the maximum number on the car at any one time.

8. *A Study of Transfers* showing the total number and the character and size of the transfer load at the transfer points.

9. *Record of Franchise Requirements* and agreements between underlying companies which affect the number and location of the cars on the various lines.

10. *Copies of Working Agreements* with operating men as to hours of work, tripper or swing back runs, etc.

11. *Full List of Car Equipment,* available, ordered and contemplated, with data as to possible changes which will allow for double-ended operation.



RECORD OF TRAFFIC AND SERVICE ON EACH ROUTE.

A monthly record is kept by the Pittsburgh Railways Company of the total number of passengers reported on each route and the number of revenue car miles operated over each route for the corresponding period.

The above diagram is a sample graphical record of this information to which has been added a curve showing the *passengers per car mile* for each month. By means of similar logs the total passenger traffic on each route may be compared month by month and year by year and a study may be made of the relative service from time to time, each route having its own standard.

This ratio of total passengers per revenue car mile is the best measure of relative service, as it takes into account the effect of transfer loads, and hence records maximum crowding.

Principles of Routing.

Before much progress can be made in re-routing the cars, an agreement will be desirable covering the fundamental principles involved, some of which may be outlined tentatively as follows:

1. Measure of service on any route should take into account the ratio between the total number of passengers in the car for the entire one way trip and the maximum number on the car at any one time. This "loading factor" is different for different routes, and if the continuous records for individual car loading is to be an indication of the relative demands for seats, this factor should be determined for each route and used intelligently.

2. To determine whether any part of the system should be in a through line or on a transfer route, the demand for seats during the rush hour on that line should be sufficient to call for say six large cars per hour; otherwise it will probably be found, that better service may be supplied by a small car operating more frequently in a shuttle service.

3. There may be routes or lines upon which shuttle service might be provided to the best advantage at all times except during rush hours, when "through" cars can be provided.

4. Transfers are not a hardship if the passengers get something in return to compensate them for the inconvenience of transfer—for instance more frequent service in large comfortable cross seat cars for at least part of the ride.

5. The small single truck cars should be operated on the hills, and on cross town transfer lines, but should be kept out of the terminal district and off the main thoroughfares.

6. In the down town district, the long haul routes should make use of the short loops and the short haul routes should use the long loops, as the long haul passengers will walk further to get a seat than the short haul passengers.

7. Through routing can be established gradually, by first connecting the short haul routes on different sides of the city in such a way as to form through routes, and as these first routes prove successful, more through routes may be added.

8. Transfers should be given in an effort to cut out useless car miles and by concentrating traffic on through routes secure the efficiency that comes with the most efficient traffic density.

9. If it can be agreed that the service to be supplied is measured by the income, then the *one city, one fare* principle

and a very liberal transfer policy can be adopted, and there will be no question as to whether or not the patrons of the system will get back in service their share of the fare.

The working out of the whole problem of routing, therefore, starts with determining definitely how much of the income is available for service, then how many car miles this appropriation will supply, and finally what disposition of this service will best supply the demands for seats.

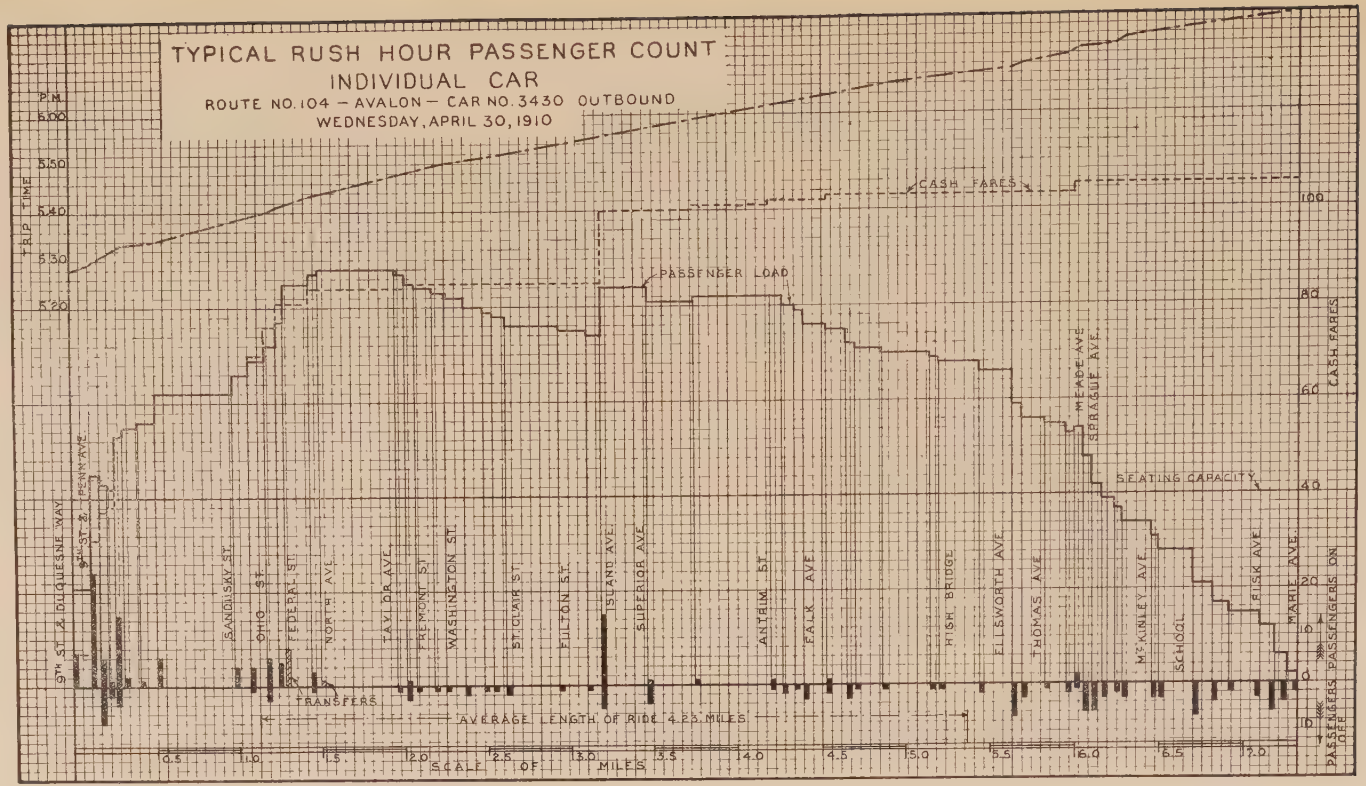
This program presupposes that the records of the present routing and service will be available, that the results of a complete system of checking future operations will be made public and that there will be a continuous and effective co-operation between the Company and the City in considering and carrying out the proposed changes and eventual improvements.

COUNT OF PASSENGERS ON INDIVIDUAL CARS.

Each route has its own characteristics which are determined largely by the length of the route and where the passengers get on and off the cars. Before deciding upon the number of cars required to supply the demand upon any route, it is best to have counts made of the passengers upon a number of individual cars. A graphical log of such a record is shown by the opposite diagram.

This kind of record will indicate at once where the maximum load is to be expected, and the relation between the maximum and the total number of passengers using the car. For instance, in this case, it will be seen that there were 105 cash fares and 8 transfers or a total of 113 passengers, whereas the maximum load on the car was only 88 passengers, equal to 77% of the total number entering the car, this percentage being due to the fact that a number of passengers left the car before others got on so that the car was "used" 1.28 times.

This characteristic of each route can be determined and used effectively to ascertain directly from the Conductors' reports whether or not the car service on any route should be changed and how much. This kind of record will also be useful in determining the allowable amount for standing in percentage of the seats supplied, as the diagram shows at once the length of the route, the average length of ride of all the passengers, and the size and extent of the standing load. If the standing load persists for a considerable distance, the inconvenience is greater than for a short period and the accommodations in the form of seats should be therefore more liberal.



COUNT OF PASSENGERS ON INDIVIDUAL CARS.

On this diagram is shown (1) Number and location of passengers boarding cars; (2) Number and location of passengers leaving car; (3) Total passengers in car at any time; (4) Total cash fares collected at any time; (5) Seating capacity of car; (6) Standing load; (7) Running time; (8) Average length of ride; (9) Total length of ride.

PASSENGER COUNTS ON INDIVIDUAL ROUTES.

The study of traffic for any route requires among other things a passenger count from a single observation point throughout an entire day. Counts made in the terminal district on all routes will show in general the same characteristic—crowding during morning and evening rush hours with lean hours intervening, however the peculiarities of traffic on the various routes can only be brought out by individaul counts, such as the typical one here presented.

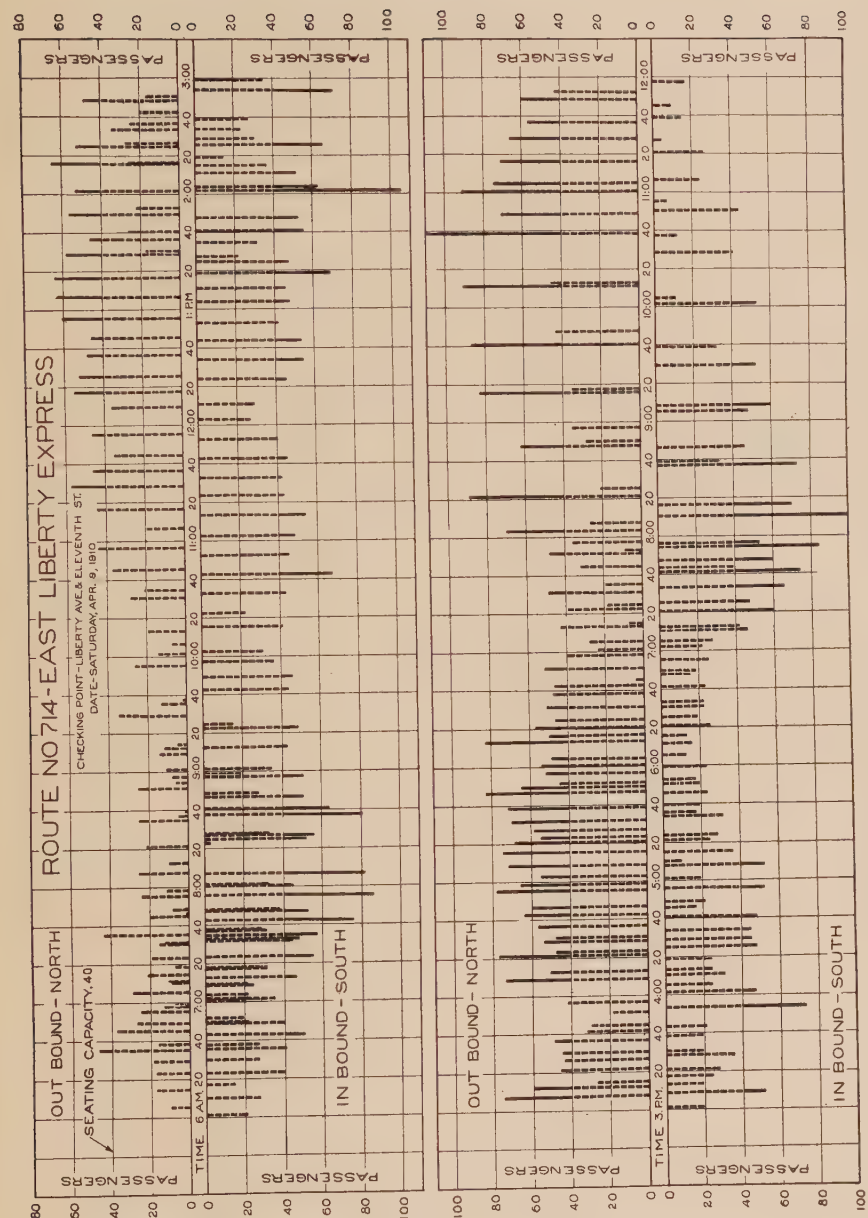
This diagram represents an 18 hour count on the East Liberty Express route at Liberty Avenue and Eleventh street near Union Depot. It is reproduced from the record of local traffic, made November, 1909, under the direction of John P. Fox. It shows (1) number of cars run, (2) comparative headway, (3) seating capacity, (4) passenger load, (5) standing load, and (6) trailers. The solid black outside the 40 seat line indicates the standing load, the dotted lines inside, the seated load. Both outbound and inbound counts are recorded, the former above the axis, the latter below.

This particular route was selected as it was the only "Express" route and its cars therefore take on very little additional load enroute after leaving Union Station outbound and vice versa, receive little extra load inbound. One car count on this route showed that only 8% additional passengers were taken on after leaving the business district, while on other routes the initial load increased as much as 50 to 125 percent and in one case 150 percent, the average over the entire city being about 26 percent.

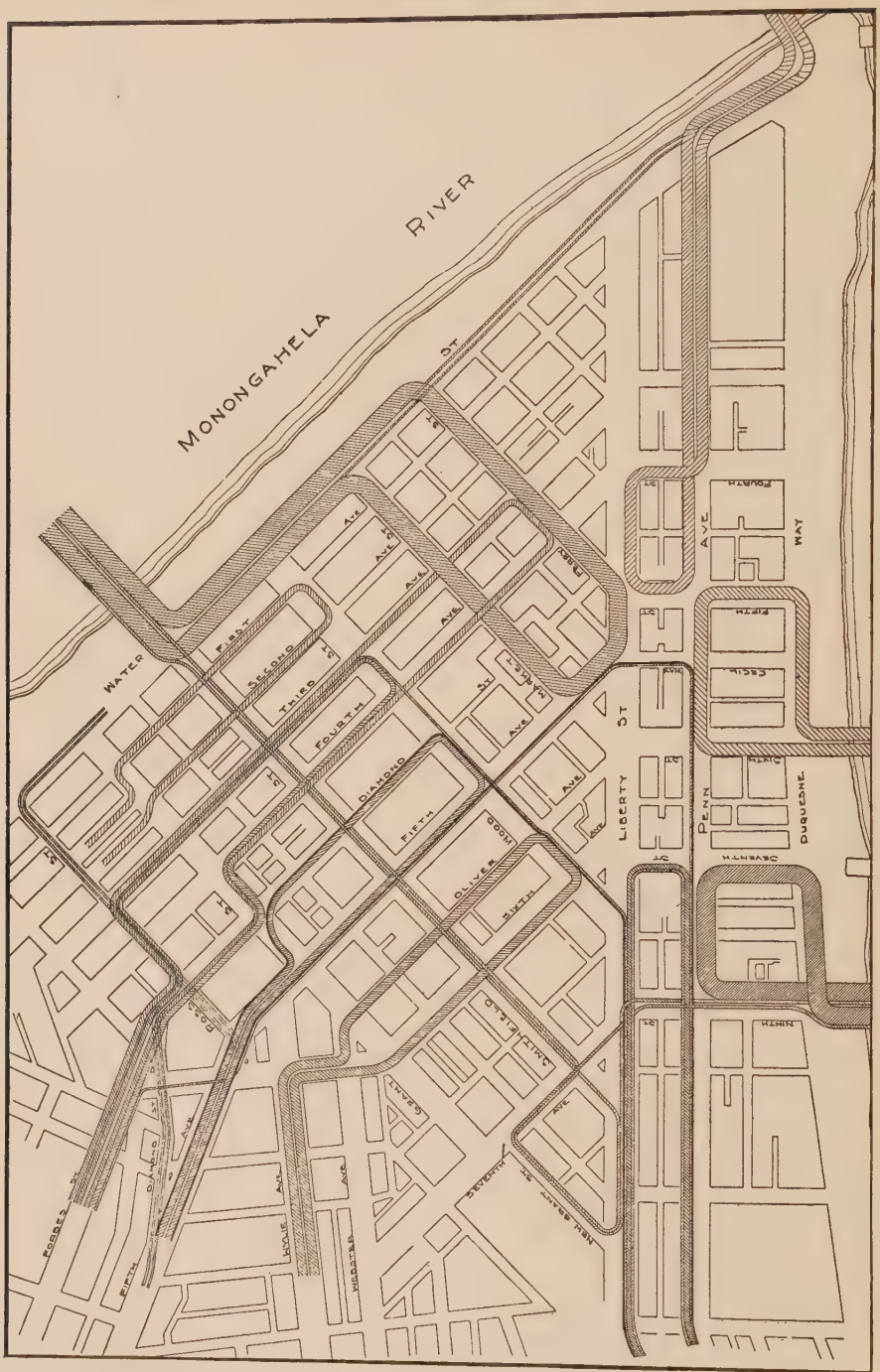
Although this count was made on Saturday, it is fairly representative of the normal inbound business traffic in the morning hours combined with a heavy outbound afternoon traffic.

This study shows neither the best nor the worst in regard to duration of overload conditions in Pittsburgh. For example, other counts as follows: Route 901—Wylie & Bedford Avenue, outbound April 16th, 1910, showed a continuous standing load from 11:20 A. M. until midnight; Route 403—Homestead & Wilmerding, April 9th, 1910, showed a continuous standing load inbound from 10:00 A. M. until 10:00 P. M. and outbound from noon until midnight.

Similar studies for all lines should be made from time to time in order to determine how far the schedules are adhered to and to what extent they are adequate to meet the needs of the traffic.

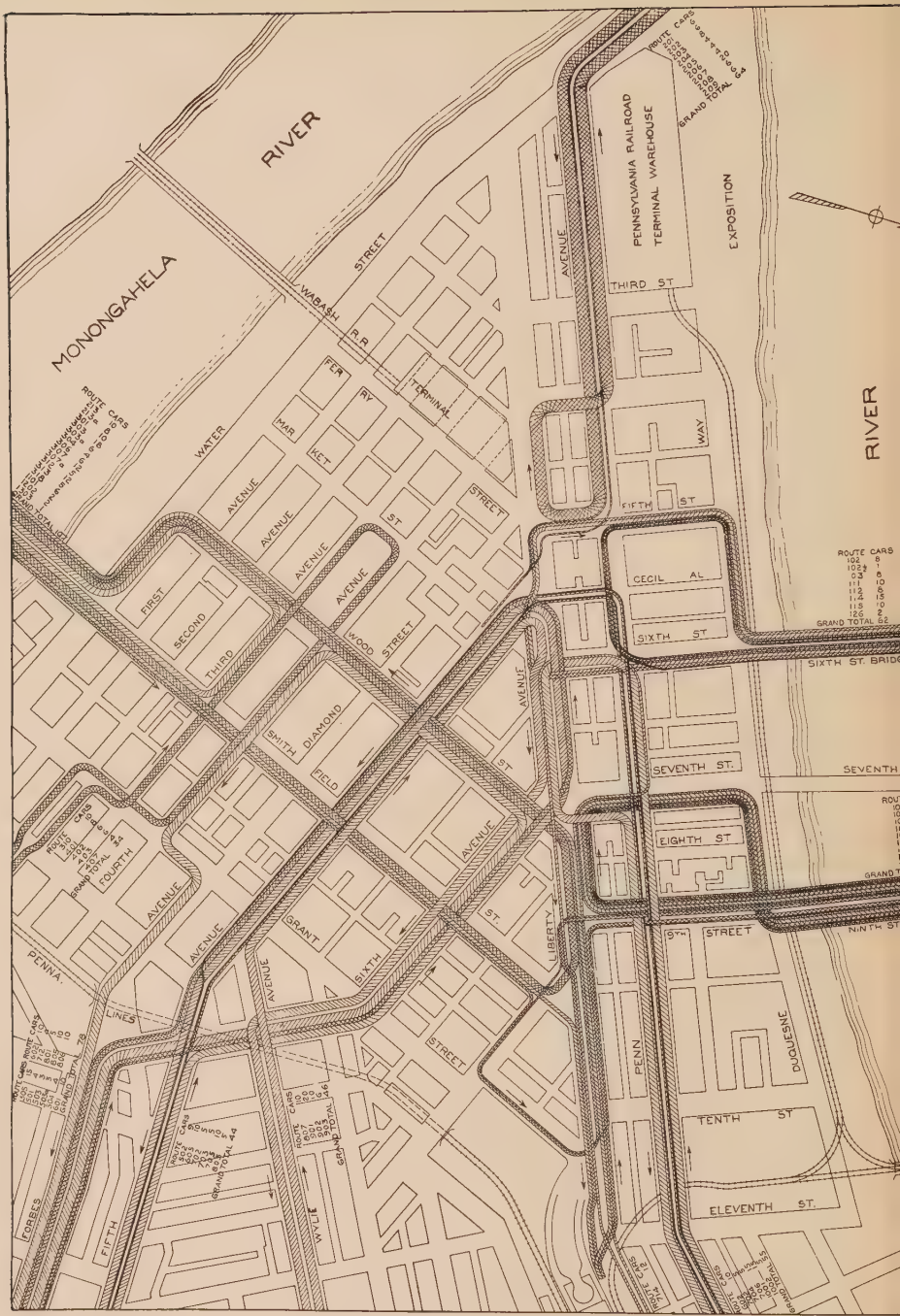


PASSENGER COUNTS ON INDIVIDUAL ROUTES.



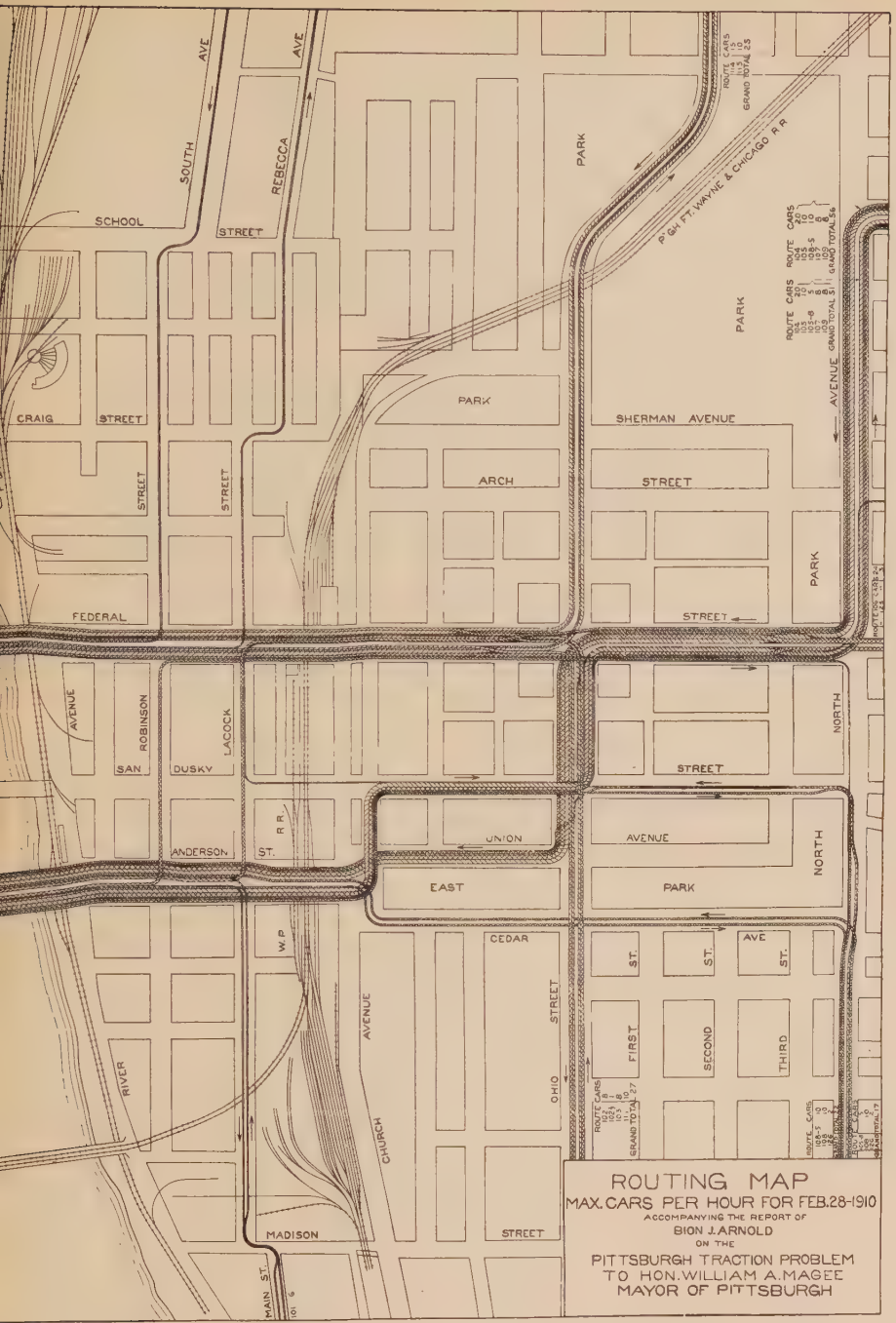
RE-ROUTING PLAN DOWNTOWN DISTRICT PROPOSED BY PITTSBURGH RAILWAYS CO.

This plan was presented to City Councils Nov. 28, 1910 in connection with certain proposed ordinances granting the Railways Company rights over additional streets necessary for its establishment. It is drawn to the same scale as the present routing plan on the opposite insert to facilitate study and comparison of important features such as volume of traffic, car interferences, long and short loops, walking distances, depot service, transfer and loading points, emergency routing, etc.



RUSH HOUR CAR MOVEMENT—PRESENT ROUTING A

This diagram, by means of shaded lines varying in width with the numb congestion in the downtown district. The system of turning back the cars o stub end terminals except one at the Union Depot. This loop routing resul layout which was brought about by the two systems of streets developing pa section of Pittsburgh is 598 per hour.



NTER SCHEDULE—DOWNTOWN TERMINAL DISTRICT.

rs on each street during one rush hour, shows the amount and location of the rious routes in the downtown business center is by means of loops with no ny conflicting crossings at street intersections on account of the converging the rivers. The maximum number of cars scheduled to leave the downtown

APPENDIX B.

REVIEW OF DEVELOPMENT IN PUBLIC UTILITY CONTROL.

With Special Reference to Street Railways.

Sections.

I. Comparative Summary of Settlement Ordinances.
II. Traction Settlement Ordinances, page 166
(a) Chicago..... 166
(b) Cleveland..... 168
(c) Philadelphia 171
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This review has been prepared to provide general data as to the scope and powers of the various legislative bodies throughout the country and thereby to convey some impression of the merits of the suggested means of regulating traction development in the Pittsburgh District which the report embodies. To present a detailed technical analysis of the forty-two State Commission Acts and various other local ordinances would, of course, be here impracticable; in fact, no such comprehensive analysis is yet available from authoritative sources owing to the labor involved. However, it is believed that digests of the more important Commissions' Acts and brief references to the miscellaneous regulative Acts of the various States will be of assistance, indicating in a general way the tendencies of the present movement for the control of public utilities. This digest is therefore suggestive rather than interpretative, and for more specific data the original acts should be referred to.

Of the various state commission acts, New York and Wisconsin have been selected as typical examples of the more comprehensive public regulation generally desired and are digested in considerable detail. Massachusetts and Pennsylvania are covered in some detail but the remaining states, only by reference. Massachusetts is a good example of successful regulation of corporate capitalization; the District of Columbia of the established authority of Government over licensed corporations, Oklahoma of the broadest conception of regulative authority. The miscellaneous Acts are cited only on points of specific control. With a few exceptions, only those commissions reporting jurisdiction over street railways are noted here.

These latter references to state regulative acts are largely drawn from a report on Public Utility Legislation, compiled by Dr. Robert H. Whitten of the Public Service Commission for New York City and from the report of a special committee of the National Association of Railroad Commissioners on Powers and Duties of State Commissions.

The three traction ordinances have been summarized in parallel columns for convenience in drawing comparisons; they are also digested by sections in order. The results of these city traction settlements are quoted from various sources to indicate the relative effectiveness of the ordinances in meeting the public viewpoint as to the production of satisfactory service at a reasonable return to the invested capital.

	In force	I. Chicago. Feb. 1, 1907.	II. Cleveland. Feb. 19, 1910.
1.	Character of Grant.	Indeterminate license—revocable.	Fixed term license—revocable.
2.	Duration of Grant.	Limited to twenty years by Illinois law.	Limited to 25 years by Ohio law.
3.	City's right to purchase.	Six months notice at specified valuation.	Six months notice at specified value + 10%.
4.	City's right to license.	Six months notice at 20% bonus (if operated for profit).	At value + 10% but lower return than to Company.
5.	Renewal of Grants.	Extension automatic.	Not less than fifteen years.
6.	Publicity of Records.	Operation and construction accounts.	Complete financial and operating.
7.	Audit of Company accounts.	Certified audit.	
8.	Supervisory Power.	Board of Supervising Engineers.	Traction Commissioner.
9.	Regulative Power.	Board of Supervising Engineers.	Traction Commissioner and Councils.
10.	Arbitration.	Board of Supervising Engineers.	Temporary Board of Arbitration.
11.	City's representation on Directorate.	None except on Board of Supervising Engineers.	None.
12.	Adequate service.	By order of City and approval of Board.	By order of City and advice of Commissioner.
13.	Re-routing.	Through routes and general unification.	Vested in City Commissioner.
14.	Total investment value–basis for computing return.	Award of Traction Valuation Commission plus approved expenditure for rehabilitation and extensions.	Award of Judge Tayler, Arbitrator plus approved expenditure for extensions.
15.	Original physical valuation.	Reproduction value less depreciation.	Depreciated—70% of reproduction value.
16.	Franchise value.	Allowed except in latest ordinance.	Allowed.
17.	Company return on total investment.	Five per cent. on total valuation + 45% of residual net income.	Five per cent on bonds, 6% on residual capital value.
18.	Capitalization of Company.	Not taken into account.	Not taken into account.
19.	City's share.	Fifty-five per cent. of residual net income above 5%.	None.
20.	Purpose of City's income.	For purchase of railways or lowering fare.	Automatically absorbed in trial fare.
21.	Extensions and Betterments.	By order of City subject to Board supervision.	May be proposed by Company only.
22.	Company return on Extensions.	Construction profit of 10% + 5% brokerage on approved cost. Return as per § 17.	Six per cent. on par value of stock issued.
23.	Future Financing by Company.	No control by city.	For additions to official valuation, not less than par.
24.	Rehabilitation by Company.	Compulsory—completion in three years.	Not provided for.
25.	Reserve Funds (% of income).	Maintenance not less than 6%. Depreciation not less than 8%. Damages to be adjusted by Board.	Depreciation four to six cents per car mile.
26.	Transfers.	Universal—free.	Universal—pay one cent.
27.	Fares.	Five cents within the city limits.	Four cents to two cents; trial fare, three cents.
28.	Operating Assessments.	For paving, repair, snow removal, sprinkling and cleaning.	Company maintains paving only, not required to repave.
29.	Operating Ratio.	Seventy per cent. for rehabilitation period.	
30.	Replacement or Reconstruction.	Excess cost over original value allowed to capital account.	

	III. Philadelphia. July 1, 1907.	Remarks. I. Chicago. II. Cleveland. III. Philadelphia.
1.	Indeterminate license—not revocable.	I. Fundamental provisions of charters, objects and character of corporations remain unchanged.
2.	Until right to purchase is exercised.	
3.	After fifty years at par capital value.	II. After expiration of grant at depreciated value + 10%.
4.	After fifty years at auction. Company has right to bid.	
5.	Extension automatic.	
6.	Only financial report to City Comptroller.	I. Except as regards internal financing and auditing by Company.
7.		II & III. No provision for certified audit.
8.	Examination and verification of reports by City Controller.	I. Complete supervision over rehabilitation and construction work.
9.	None except police powers.	I. Except on stock and bond issues. Police powers reserved.
10.	Subway loop only—none for surface system.	III. On future connections with City Hall Subway loop.
11.	Mayor and two citizens (without liability).	
12.	Not compulsory.	I. & II. Covers equipment, service and routing subject to (I) Board's or (II) Commissioners' approval.
13.	No power.	I & II. Subject to fair return on investment.
14.	"Paid up" capital value.	I. Additions to valuation include percentage profit allowed Company.
15.	No physical valuation provided for.	
16.	Franchise term reduced from 999 to fifty years.	I. Franchise value in Consolidated Railway ordinance offset by other considerations.
17.	Six per cent. on capital—50% of residual net income.	II. Rate on refunding bonds may be increased to 6%.
18.	Basis of computing return.	I. Company not limited in issuance of securities.
19.	Fifty per cent. of net income above 6%.	III. Six per cent. dividend cumulative; excess dividend optional with company.
20.	Not specified.	
21.	Proposed by either—Company has first option.	I. Minimum track extension, eight miles (City Rys. Co.), and 12 miles (Chicago Rys. Co.) or a total of twenty miles per year.
22.	Not specified.	III. Six per cent. on par value to outside operator.
23.	On City's approval—not less than par.	I & II. No control when not affecting established valuation or return.
24.	Not provided for.	
25.	"Sinking fund"—$120,000 to $360,000 per year; becomes City's property without limitations as to use.	III. Payments begin in 1912. In sufficient to retire original capital stock in fifty years; increase $60,000 per year each decade, $360,000 for balance of term.
26.	Universal— pay three cents; some free.	I. With certain restrictions in the downtown district until after completion of subways.
27.	Five cents; changes only by consent.	I. Right to commute fare reserved by the city to the extent of its share in net profit.
28.	Fixed sum—$500,000 to $700,000 per year in lieu of paving, snow removal and car tax.	III. Yearly payments increase $50,000 each ten years up to $700,000; no provision after fifty years.
29		I. Ratio to be adjusted by Board after three year period.
30		

Section II.—Traction Settlement Ordinances.

A.—CHICAGO TRACTION ORDINANCES.

Passed Feb. 11, 1907: Ratified by referendum Apr. 2, 1907: Grant expires* in twenty years.

Participants; Originally—Chicago City Railway Company (now includes Southern Street Railway Company), Chicago Railways Company (originally Chicago Union Traction Company).

Subsequently—Calumet & South Chicago Railway Company, Passed March 30, 1908, accepted by the company May 29, 1908. Consolidated Railway Company (not especially included in this abstract) passed October 11, 1910.

Differences between ordinances: Following abstract relates to the City Railway Ordinance. The Chicago Railways ordinance differs in some particulars due to "peculiar conditions attaching to the fact that the old Union Traction System was composed of a number of underlying corporations, and also that the city had to specifically treat with the subject of tunnels under the river." The Calumet ordinance follows the same general lines, differing only where necessitated by local conditions.

Purpose: (from preamble) "To provide for the reconstruction, re-equipment, extension * * * and unified operation of the railway system * * * to deal freely with the subject of transportation within the city streets as a whole * * * and to determine the definite terms and conditions upon which the city shall have the right at any time to purchase and take over the street railway system."

1. *Consent:* City grants right of occupancy. In joint grants to several companies, division of expenditures provided for.

2. *Rehabilitation:* To be comprehensive, in accordance with detailed specifications (appended to ordinance) and under supervision of the Board of Supervising Engineers.

3. *Extensions:* Company to construct certain specified extensions. Extensions in unoccupied streets can be ordered by Councils, subject to frontage consent laws of Illinois. Company is not obligated to build parallel lines nearer than one-half mile, nor to extend faster than four miles of double track, or eight miles (†) single track per year if return on new capital would be reduced to an inadequate or an unreasonably small amount. (*See Section* 25).

4. *Motive Power:* Authorizes overhead trolley system. Councils may order underground trolley after three years, subject to provision for security of adequate return to the Company.

5. *Joint use of poles:* City may use poles and conduits without compensation for municipal purposes, i. e. for telephone, telegraph and for electric wires and lamps.

6. *Subways:* Companies required at the option of the City to contribute not over $5,000,000 to the construction of a city subway to be shared by the companies as downtown terminals. Future extensions of the system are provided for, in the cost of which the companies shall participate. All plans subject to the approval of the Board of Supervising Engineers. Joint use of the subway by elevated roads authorized. Company participation in extensions not compulsory if jeopardizing a reasonable return above 5%.

7. *Supervision:* All construction, equipment, rehabilitation and extensions (except subways) to be supervised by the Board and financed by the companies. Board must approve contracts and payments. Company to receive ten per cent. construction profit and five per cent. brokerage. Total cost to be added to capital valuation. Board determines assignment of expenditures to construction and to repair and renewal accounts. During the three year period of rehabilitation, the difference between the actual operating expense and the prescribed seventy per cent. of gross earnings, is to be expended for renewals but not charged to capital account. After the

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*Laws of Illinois limit franchise grants to 20 years.

†City Railways 8 miles, Chicago Railways 12 miles, making a total for the two roads of 20 miles per year.

three year period, renewals are not to be capitalized, excepting only the excess cost of new parts over the cost of original parts.

8. *Track removals:* Requires Company to remove unused tracks, otherwise done by the City at the company's expense.

9. *Sale of Property:* Provides for sale and accounting of property included in valuation but no longer required in operation of the system.

10. *Service Regulations:* Covers cars (including heating, lighting, ventilation and cleanliness), equipment (including brakes and fenders), employees, abandonment of trailers, etc. City reserves the right to make regulations necessary to secure the safety, welfare and accomodation of the public. Approval of such regulations by the Board shall be binding, upon the Company but not upon the City as to the reasonableness thereof.

11-12. *Fares:* Five cent fare established with free transfer for a continuous trip in one general direction within the present or future city limits with certain transfer restrictions in the downtown district until a subway is built. Transfers allowed between lines passing within 200 feet of each other. No passes except to policemen and firemen in uniform.

13. *Through Routes:* Twenty-one routes specified. Additional ones later as traffic may warrant. Board determines necessity therefor, subject to judicial review. Company to co-operate with other corporations in establishing through routes.

14-15. *Paving:* Company to pave, repair, sprinkle and clean those portions of the streets occupied by its tracks (eight feet wide for single track, sixteen feet for double track). Also additional paving necessary to restore regraded streets to passable condition. Foundation, paving, rail and joints specified.

16. *Reserve Funds:* For maintenance and repairs. not less than six per cent for renewals and depreciation, not less than eight per cent. of gross earnings—to take effect after expiration of three year period. Expenditures subject to approval of Board and considered as part of operating expenses. Balance of fund reverts to City when property is purchased. If specified percentages are not sufficient, the Board is to increase allowances out of operating expenses.

17-18. *Insurance and Damages:* Both included in operating expenses. A special reserve fund to be maintained for damages. Companies required to keep property insured to full insurable value. Loss by fire in excess of insurance to be met by the Company, but not out of operating receipts.

19. *Company salaries:* Compensation regulated by Board to reasonable figure for service rendered when chargeable to operating expenses. Company is not restricted in the payment of any desired salaries out of its own share of the net profits. Disputes to be settled by the Board, subject to judicial review.

20-21. *City Purchase:* City may purchase any February or August 1st on six months notice at original valuation plus approved capital additions. If City buys within twenty years for leasing and not for municipal operation, the Company is to receive a bonus of twenty per cent on the purchase price. If within three year period, the Company may complete the work and receive construction profit and brokerage thereon (10%+5%).

22-23. *Licensee:* City may license any purchaser within twenty years who pays a bonus of twenty per cent. if operating for profit, but this bonus is waived if operated "pro bono publico." If right to purchase is not exercised by the city, it may allow a licensee to purchase the property upon the same terms (*) as the City at the expiration of the twenty year franchise period.

24. *Return on Investment:* After operating expenses and taxes, five per cent. on total capital value allowed. Remaining net earnings are to be divided between the City and the Company, 55% and 45% respectively. City may apply its share to commutation of fares, or accumulate it in a sinking fund for future purchase or construction of railways.

25. *Limitations of Extensions:* Company not required to increase

* Company has no right to operate after 20 years, but ordinance gives it right to protect its investment.

its capital account so fast by constructing extensions prescribed by the City in addition to those required by ordinance as to unreasonably increase the investment and thereby reduce its share of the net return.

26-28. *Deposits:* Defines qualifications of depositaries and interest payments. City not liable for safety of deposits.

29-30. *Reports and Records:* Requires annual reports of operation from the company. City to examine and audit Company accounts. Prohibits removal of records or vouchers.

31. *Forfeiture:* Penalty for non-compliance with provisions of ordinance for three months after notice, forfeiture of grant; Right of forfeiture not to interfere with right of pledgee or mortgagee to foreclose, subject to fundamental provisions of the ordinance. In case of foreclosure, the city has right to purchase or license for municipal operation without liability to pay twenty per cent. bonus.

32. *Waivers:* Company surrenders, at the time of acceptance of the ordinance, all of its rights in the streets except those granted by the ordinance.

33. *Intervention:* City has the right of intervention to protect its interests in any litigation involving the company.

34. *Board of Supervising Engineers:* Three members, one representing the Company, one the City and one neutral, the latter named in the ordinance. Expenses to be paid by the companies during the first three years, out of capital account, thereafter out of earnings.

35. *Police Powers:* City reserves such powers for regulative purposes.

37-42. *Legal Provisions;* Relating to lessees and successors, consent of council, title, bond and referendum.

"Epitomized, (*) The result presents a comprehensive plan of municipal control of a public service rendered by a private corporation for individual profit, wherein the municipality escapes financial burden and managerial responsibilities, but becomes a preferred profit sharer and possible future owner. The amplified regulation and provisions are founded upon certain underlying principles, such as (1) Fair dealings with the public; (2) Fair dealings with the corporations; (3) service, equipment and construction without limit as to the possibilities for good; and (4) opportunities for evil minimized."

B.—CLEVELAND TRACTION ORDINANCE.

Passed Dec. 18, 1909. Approved at referendum Feb. 17, 1910; Effective Feb. 19, 1910; Expires May 1, 1934.†

Participants: City of Cleveland and The Cleveland Railway Company (with its subsidiaries and lessees, The Forest City Railway Company; The Municipal Traction Company; The Low Fare Railway Company; The Neutral Street Railway Company).

47. *Purpose.* "To establish and settle the relations between the City and the Cleveland Railway Company by contract," which will secure capital unimpaired and a fair rate of return on actual investment, establish fares, secure adequate service, and will provide for supervision of railway operations, ultimate acquisition by the City or Licensee, fair valuation of property with subsequent improvements, and public regulation in the interest of good service.

10. *City Street Railroad Commissioner.* To be appointed and removed by the Mayor, paid by the Company. Salary not to exceed $1,000 per month. Duties—to supervise, inspect and to interpret provisions of ordinance and to advise the City in all matters pertaining to their provisions.

11-14. *Board of Arbitration.* To be created in event of disagreement. To consist of three members, one neutral, all paid by the Company. Powers cover all questions involved in contract-ordinance, in which the decision of Commissioner is contested. Penalty for non-compliance with decisions

*By Walter L. Fisher.

†Laws of the State of Ohio do not permit grants over 25 years.

of Board is a reduction not over one per cent. in rate of return on capital account until orders are deemed to have been carried out.

15. *Accounting.* To conform to Standard Classification of American Electric Railway Association or other authority.

9. *Regulation.* "The city reserves to itself the entire control of service" including schedules, routes, terminals, etc. if not inconsistent with specified rate of return. Also controls types of construction, rolling stock, motive power, track, etc.

8. *Cars.* Ordinance specifies Pay-Enter cars with fare boxes. Seventy-five per cent. of cost of conversion applied to capital account. Single truck cars revert to trailer service only.

7. *Paving.* Between tracks and one foot outside outer rail. Company required to maintain only, not to repave.

16. *Capital Value.* Cleveland Railway Company* (Tayler decision) $21,127,149 (includes $3,615,843 franchise value), Forest City Railway Co. $1,805,500—Total, $22,932,749. This value is supposed to be seventy per cent of the cost to reproduce. Accrued interest $1,158,300—Total, $24,-091,049.00. Deduct bonded and floating debt, $9,416,000—Net "*Residual*" capital value $14,675,600.

18. *Additions to Capital Value.* Bonds and Stocks for extensions, betterments or improvements only to be sold and capitalized at par value. Six per cent. stock return allowed, and no more.

32. *City's right to purchase.* On six months notice at valuation plus ten per cent. Extensions on same basis.

36. *Price after expiration of grant.* The "price for street railroad purposes" (viz.; cost to reproduce minus depreciation) plus ten per cent. No franchise values to be computed. City may decline to accept the arbitrated value, but company must accept it.

16. *Valuation.* Capital valuation fixed (by ordinance) is for the sole purpose of determining the return to the Company from the carriage of passengers and for the purpose of fixing from time to time the rate of fare and the price at which the purchase of the property of the Company may be made by City or licensee. Basis of valuation† Cleveland Railway Company property. Cost to reproduce less depreciation; percentages additional items allowed for (a) specific and (b) general overhead values—fifteen per cent. on total. Good will, going value and extinguished investment disallowed. Unexpired franchise values included on city system only, not on suburban lines. Forest City Railway Company valuation agreed upon by "*historical method*" including extinguished investment and franchise value.

39. *Corporate rights.* Ordinance does not abridge rights of Company or powers of Board of Directors. Company may issue any kind or amount of securities without the consent of the City, *provided* they are not considered as part of capital value established for rate-making purposes or ultimate purchases.

16. *Rate of return.* All net earnings from operation to be applied to an "interest fund," balance to be maintained at $500,000. Out of this fund to be paid in order, taxes, interest and dividends. Five per cent. allowed on bonded indebtedness, six per cent. on floating indebtedness and six per cent. on residual capital value. Any substantial variation from balance of $500,000 authorizes reduction or raising of fares.

19. *Operating expenses.* Allowance subject to adjustment by agreement or arbitration. Trial allowance, 11.5 cents per passenger car mile for motor cars, 6.9 cents (60%) for trailers. If rush hour load requires over twice the normal car mileage, this allowance to be increased.

20-21. *Depreciation and Maintenance Fund.* Intent to maintain property at seventy per cent. of reproduction value. Monthly allowances, graded from four to six cents per car mile, heaviest in summer months. Fund to be cumulative; may be invested in Company bonds if not needed.

22. *Fare.* Scale of ten trial fares provided for. Maximum four cents, seven tickets for a quarter, one cent transfers, no rebate. Minimum two

* Trackage reported, 260 miles.
† Decision of Judge R. W. Taylor, Arbitrator.

cents, one cent transfer, one cent rebate. Initial trial fare three cents, one cent transfer.

23. *Trial period.* Eight months (or three months after complete installation of Pay-Enter car equipment). Subsequent trial periods, six months.

22. *Transfers.* Ordinance provides for "reissuable tickets" transfer-on-transfer possible on certain lines. No round trips, transfer abuse to be regulated. Passenger cannot take first car approaching on a trunk line but must wait for his particular car.

27-29. *Extensions.* Company alone may propose extensions or improvements. City to review estimates and supervise construction. Suburban lines entering the city must conform to city regulations. Deficit of suburban operation must be carried separately and not be made up out of the city earnings.

32-37. *Licensees.* City may at any time grant to a licensee authority to take over road at lower rate of return on "residual capital value" than company receives. Price specified, total value plus ten per cent.

47. *Invalidation.* In cases of invalidation of provisions of ordinance by Court. (1) City Council shall have the right to establish fare consistent with maintenance of $500,000 balance in interest fund, and ability of Company to meet fixed charges on capital value. (2) Council shall have power to enforce arbitration awards. (3) City Auditor or other designated municipal officer may be empowered with Commissioner's duties in case of his removal. All substitutive acts of Council subject to Court review.

45. *Repudiation by Company.* Operates as a forfeiture of the grant. Six months grace allowed for compliance after notification by the City.

6. *Car License Fees.* Waived by the City in consideration of ordinance restrictions.

9. *Unjust Orders.* For reparation, Company must first comply, then order arbitration. Ordinance provides for recovering losses.

16. *Refunding.* Floating debt may be refunded by sale of bonds at best market price obtainable above par. Return allowed thereon may be increased to six per cent.

31. *Free transportation.* Policemen, firemen and employees only.

41-42. *Renewal of Grant.* City may renew grant for a period of not less than fifteen years with "no substantial additional burden." When the term comes to have less than fifteen years life, Company may charge maximum fare, control schedules and apply surplus to reduction of capital account, but if City extends grant, this operates as a reversion to previous basis of operation.

Extracts From Judge Taylor's Decision, Cleveland Electric Railway Arbitration.

Basis of Valuation. Cost to reproduce present physical property less depreciation. Extinguished investment not given consideration. Good will or going value disallowed in the face of monopolistic grant. Valuation held to be seventy per cent. of reproduction value (including overhead charges). Forest City Railway alone valued "by historical method" (allowances for discarded investment).

Overhead Value. Classified as "specific" and "general," the latter applying to the enterprise as a whole. Specific values—Track 10%; pavement 3%; cars, land, buildings, overhead, construction, returns, batteries, rolling stock 5%. General values—For engineering, financing, legal expense, organization, administration, insurance, superintendence, interest during construction, delays, consents, incidentals, contingencies, 15% on total.

Suburban Lines. Franchise values disallowed, suburbs served will ultimately become part of the city when extra fare zone within the city limits will be intolerable, hence suburban grants constitute a burden that must be carried which offsets franchise values.

Moral Obligation. Municipal Traction Company to Forest City Railway Company upheld because occupying favored streets and serving districts of high density with short haul; therefore, ability to earn six per cent.

on stock above cost of operation with a three cent fare is held to be a valuable consideration. This obligation to be adjusted by payment of 7.5% on par value of stock—equals accrued interest from October 1, 1908 to January 1, 1910.

C.—PHILADELPHIA TRACTION ORDINANCE.

Passed July 1, 1907: Approved by Mayor July 1, 1907: Duration not defined.

Participants: City of Philadelphia and Philadelphia Rapid Transit Company.

Purpose: "Affecting, fixing and regulating the duties, powers, rights and liabilities of the City and of the Philadelphia Rapid Transit Company and its subsidiary companies * * * providing for the future management and extension of the Street Railway system * * * and the final acquisition of its lease holds and property by the City, * * *."

Authority: Legislative Act of April 15th, 1907, authorizing contracts between cities, boroughs or townships and street railway companies for fixing relations, rights and responsibilities of the contending parties.

1. *Capital Stock:* Company to call on stockholders for unpaid stock to be expended in improvements and extensions. No further increase without the consent of the City. Company not to part with stock, leaseholds or franchises without City's consent.

2-3. *Extensions:* Company must submit plan for raising capital for extensions it desires to make.

City has the right to determine extensions, with terms and conditions of financing. If not accepted by the Company, City may grant rights to any other company, subject to city's right to regulation and purchase and six per cent. return on invested capital.

3. *Funding:* Capital for extensions to be raised on bond issues at not below par, or if necessary by stock issues paid up at par.

4. *Directors:* Mayor and two citizens to become members of the Board of Directors with vote but without liability as directors.

5. *Audit:* Company to file fiscal statement of financial operations and City Comptroller shall verify for report to Councils.

6. *Dividends.* Company may declare six per cent. dividend on paid up capital without sharing with the City. Beyond six per cent, City shares equally. Excess dividend is optional with directors and cumulative.

7. *Subway-Elevated:* Company surrenders Broad Street Subway franchise. City confirms franchise to build Frankford elevated line with three years under foregoing stipulations (§3) but does not obligate the company to build.

In the event of a future Broad Street Subway built by the City or other company, arrangements around city hall loop to be determined by Board of Arbitrators.

8. *Renewal of Franchises:* City confirms all prior franchise grants (including subsidiaries) "free of all terms" etc. not herein provided for and waives all rights of repeal *provided* that the rate of fare may be changed from time to time (by common consent) and that the City retains "police power" over management and operation of lines.

9. *Sinking Fund:* Company to establish fund. Under control of a Commission consisting of the Mayor, the President of the Company and the President of the Board of Directors of City Trusts. Monthly payments increase from $10,000 to $30,000 by steps of $5,000 each decade beginning in 1912. Payments treated as fixed charges prior to dividends. Trustees may invest in stock of Company at not above par and underlying bonds at four per cent. City Comptroller audits. When fund aggregates $5,000,000 councils may turn over fund and future payments to City Treasurer.

10. *Fixed Sum License:* "In leiu and satisfaction of all obligations and liabilities on the part of the Company or its subsidiaries for paving, repaving or repair of streets occupied by their lines * * * for removal of snow * * * and all license fees on cars." Fixed annual license to be paid by the Company to the City increasing in five decades from $500,000 to

$700,000 per year. Streets added or withdrawn computed on square yard basis, eight cents for asphalt, seven cents for macadam and six cents for all other kinds. This does not relieve Company from taxation. But all future additions to taxes are to be credited to license and dividend payments to City.

11. *Right to Purchase:* After July 1st, 1957, on six months notice, City may purchase road at par capital stock plus additions authorized. Sinking fund available for part payment. This contract in force until right of purchase is exercised. Rights of City assignable at auction. Company may bid.

12. *City Liability:* Contract does not render City liable for any obligations of Company nor involve city credit. City not a partner in enterprise. Joint dividend (over six per cent.) is in lieu of additional taxes and assessments, City has the right to impose.

13. *City Consent:* Only given by Councils.

14. *Prior Contracts:* Between City and Company cancelled and superceded except certain agreements for grade crossings, temporary tracks and Broad Street tracks.

15. *Supersedes:* This contract repeals ordinance of July 7, 1857, regulating passenger railways and all supplementary ordinances including those of April 1, 1859 and March 30, 1893, providing for paving, snow removal, removal of wires and poles to underground system, right of entry and purchase at property value.

Section III.—State Regulation by Commission.

NEW YORK PUBLIC SERVICE COMMISSION.

Established under Law of 1907. Abolishing the then existing Railroad Commission, the State, Gas and Electricity Commission, the State Inspector of Gas Meters, and the New York Rapid Transit Commission, and transferring their powers to the Public Service Commission.

Establishing two administrative districts, one for Greater New York and the other for the remainder of the State.

Jurisdiction over gas, electric light and power companies; also express companies operated upon or in connection with a railroad or street railway, street and interurban railways and steam railroads or other common carriers. Does not have jurisdiction over telephone, telegraph and water companies.

Powers. To conduct investigations (with power of entry and subpoena); to determine and impose reasonable service and rates; to establish uniform systems of accounting for company reports; to require reports of accident and investigate them; to conduct periodical inspections of condition of properties; to supervise all proposed issues or transfers of stocks and bonds. Commission laws contain no express provision for certified audit of company accounts other than verification of the companies' sworn reports, nor for the determination of depreciation rates, but does provide for the regulation of competition by requiring certificate of public convenience and necessity before exercise of franchise. While valuation of properties is not specified in the utilities law, such right has been inferred and exercised in connection with re-organization and rate cases.

Franchises. Indeterminate permit with certificate of public convenience and necessity.

Competition. No franchise to be exercised until Commission has decided after public hearing that it is justifiable by "public convenience and necessity."

Extensions. Law empowers Commission to order such repairs, improvements and changes as it deems necessary to "promote the security or convenience of the public." This also applies to interconnections between adjacent properties for establishing through routes and joint fares.

Orders. Of Commission are prima facie, take effect when designated and remain in force until rescinded by the Commission or Courts. Proceed-

ings instituted by the Commission take precedence over all other civil causes except elections.

Municipal Ownership. At the instance of Governor Hughes, the legislature in 1908-9 passed constitutional amendments excluding from the municipal debt limit, bonds issued for enterprises producing revenue in excess of maintenance charges. These were adopted by popular vote in 1909.

Rapid Transit. Act empowers Commission for the first district (New York City) to grant franchises for certain classes of rapid transit lines, and may lay out new transit routes subject to the approval of the City authorities, and let contracts and supervise construction. Under certain conditions the city may directly operate municipal transit routes, through the agency of the Public Service Commission.

WISCONSIN RAILROAD COMMISSION.

Established in 1905 with jurisdiction over steam railroad, express, car, freight line and sleeping car companies. In 1907 its jurisdiction was extended to include telegraph companies and street and interurban railways. Also by Public Utility Act, telephone, water, light, heat and power utilities, whether owned by private capital or municipalities.

Powers. As to all subjects over which it has jurisdiction; to determine and impose reasonable service and rates; to establish uniform systems of accounting; as to telephone, water, light, heat and power utilities, to make valuations of properties; to examine and audit company accounts; to fix standards of measure, quality or other conditions pertaining to product or service; to regulate competition and to keep informed concerning improvements, extensions and additions to utility properties. "Every Public Utility shall carry a proper and adequate depreciation account, whenever the Commission, after investigation, shall determine that such depreciation account can be reasonably required." Further, the Commission must determine "what are the proper and adequate rates of depreciation of the several classes of property of each public utility."

Indeterminate Permit. The Utilities Law prescribes that "every license, permit or franchise hereafter granted * * * shall have the effect of an indeterminate permit subject to the provisions of this Act * * *" and "that the municipality * * * may purchase the property of such public utility * * * at any time as provided herein, paying therefor just compensation to be determined by the Commission and according to the terms and conditions fixed by said Commission." Any street railway company upon the surrender of its unexpired "term" franchises may continue operating indefinitely under an indeterminate franchise. For utilities other than railways this surrender (*) must take place prior to January 1, 1911, but no time limit is placed upon street railways. No road may be constructed without a certificate of "public convenience and necessity."

Competition. No competitive public utility franchises to be exercised until the Commission, after public hearing, decides that it is "required by public convenience and necessity."

Orders. Of Commission are prima facie, take effect when designated and remain in force until rescinded by the Commission or the Courts. Court proceedings for rescission take precedence over all other civil causes except elections.

Extensions. The utilities law empowers any municipality to require "such extensions to its physical plant within said municiplaity as shall be reasonable and necessary in the interest of the public" subject to appeal to the Commission.

Joint trackage. Another Wisconsin Act provides that in any stree where two companies each own and operate single track, the City may require by ordinance that the companies jointly use such tracks, either by agreement or condemnation, so that cars shall run only one way on each track and also provides that no city laying tracks over bridges or viaducts shall

* Up to August 31, 1910, sixty-eight Gas, Water and Light Companies had exchanged their term franchises for indeterminate permits, but only one traction company, The Menominee & Marinette Light & Traction Company.

grant exclusive franchises to any railway company so as to preempt the approaches thereto.

Municipal Ownership. Laws provide for issue of bonds secured by mortgage upon plant without municipal liability, and also provide for municipal railway terminals in cities of the first class with right of lease. The construction of a municipal plant where a private plant exists under an indeterminate franchise is subject to the same procedure requiring certificate of public convenience and necessity as an independent private undertaking. Municipalities may acquire any utility by purchase at a "just and reasonable compensation," as determined by the Commission, subject to judicial review.

Foreign Corporations. No franchises to be granted or transferred except to corporations organized under the laws of Wisconsin.

MASSACHUSETTS RAILROAD COMMISSION.

This Commission has been in existence forty-one years. Has jurisdiction over common carriers including express and steamship companies. A separate Board of Gas and Electric Light Commissioners has supervision over the other utilities. In Boston and vicinity the Boston Transit Commission conducts investigations, builds subways, etc. as directed from time to time by the State Legislature.

The Railroad Commission has general supervision and recommendatory powers over service, rates and the issue of securities, its orders being enforceable by the State Supreme Court.

Franchises. Massachusetts is the home of indeterminate franchises. All municipal grants are revocable at any time without compensation, but without provision for municipal purchase.

Express and light freight may be carried by street railways with the approval of the local authorities and the Railroad Commission or of the Commission alone, if the consent of the local authorities cannot be secured. The municipality, with the approval of the Commission, may establish regulations covering such traffic. (Act of 1907.)

Rapid Transit. Acts of 1906-7 enabled the Boston Transit Commission to conduct a general investigation of street and freight traffic in the Boston District; authorized the contsruction of an east and west tunnel in Boston, known as the Riverbank subway, and provided a method of determining damages to abutting property from elevated lines, based upon the determination of the fact whether depreciation of such property exceeded the appreciation due to the introduction of rapid transit.

PENNSYLVANIA STATE RAILROAD COMMISSION.

This body, created in 1908, has general authority over "common carriers" and certain utilities, (including pipe lines, sleeping car, express, telephone and telegraph companies), to make investigations and recommendations regarding service, equipment and rates, but has no power to enforce its orders except by appeal to and action of the Attorney General. Power of supervision and investigation over corporations, (railroad, banking, mining, telephone, manufacturing and other business corporations) is vested constitutionally in the State Secretary of Internal Affairs, to whom are made annual reports of corporate operations. The form of these reports has been approved by the Commission and it accordingly does not require reports to be made to it. The provisions for control over the issue of corporation securities appear to be so inadequate that the Commission has requested the Legislature to either strengthen or repeal them entirely.

Competition. Legislative Act of 1907 prohibits a railroad corporation from acquiring, purchasing or guaranteeing the securities, physical property or franchises of any competing street railway corporation.

Fares.—Express. Acts of 1907 specify a maximum fare of five cents for a continuous ride in one car within the corporate limits of any city of the second class over the lines of any one railway company, and confer on street

railway companies the right to conduct an express business, subject to reasonable regulation prescribed by local authorities.

Section IV. –Commission Legislation of Other States.

Maryland Public Service Commission established by Act of 1910, with broad supervisory and regulative powers over common carriers gas, electric light and power, telephone, telegraph, heating, refrigerating and water companies. Valuation of property provided for.

New Jersey Board of Public Utility Commissioners established by Act of 1910 amending Railroad Commission Law of 1907. The original Act limited the powers of the Commission to investigation and recommendation, but by subsequent amendments these powers were broadened so as to make its orders compulsory.

District of Columbia. Congressional Act of 1908, empowered the Interstate Commerce Commission to regulate the service of traction companies operating in the District. Under this Act, an Electric Railway Commission was created in an advisory capacity with authority only to hold hearings and obtain facts necessary for recommendation to the Interstate Commerce Commission. One result of this relation is a "code of regulations for the operation of elevated and street railways in the District of Columbia." This code comprises among other things the following. Closed cars to be heated to 40-60° F. from November 1st to April 1st; trailers abolished after 1911 unless of double truck type with separate conductor; interurban cars not required to stop locally; passengers may alight at any street; cars must stop for waiting passengers unless all seats are occupied; roads must operate "sufficient cars * * * without crowding" as may be ordered by the Interstate Commerce Commission.

Congress has the power to order construction and extensions; removal of tracks and restoration of pavement; joint use of tracks by two or more companies; joint construction of temporary tracks; new equipment under penalty of abrogation of franchise. Cost of regrading reconstructed tracks to be borne by the company. Transfers cannot be abolished except by Congressional authority. All franchises granted in the District are with rights reserved to amend or repeal at any time.

Connecticut Railroad Commission has limited supervisory powers over carriers and no power to regulate rates.

Maine Railroad Commission has general powers, but is not a rate fixing board except in adjudications upon complaint. Act of 1907 transfers from the Supreme Court to the Railroad Commission power to grant street railway franchises denied by municipalities. This amends the former law providing for an appeal from the local authorities.

Michigan Railroad Commission created by Act of 1907 replacing the former office of Railroad Commissioner. Has general regulative powers.

Nebraska Railway Commission has power of rate regulation over all carriers. The validity of its power was tested in 1907, but upheld. The Commission has conducted valuations of property when necessary, as in the Lincoln Traction Company rate case. Under special appropriation of 1909, complete valuations of all properties has been undertaken.

North Carolina Corporation Commission is a Court of Record with general supervisory powers.

Oklahoma Corporation Commission possesses very broad constitutional authority over all carriers and utilities with power to enforce its orders. One of the broadest provisions follows: "Whenever any business by reason of its nature, extent or the existence of a virtual monopoly therein, is such that the public must use same or its services * * * or the commodities bought or sold * * * in such a manner as to make it of public consequence * * * said business is a public business and subject to be controlled by the State * * * as to all of its practices, prices, rates and charges."

Rhode Island Railroad Commissioner replacing the former Railroad Commission. Has limited powers over carriers. Many general powers are vested in temporary commissions, state or local government.

Virginia Corporation Commission has supervisory control over all transportation and transmission companies with power to enforce orders by legal process.

Washington Railroad Commission has extensive regulative powers except over street railways, and has carried out complete valuations of railroad property as a basis for the determination of fair rates.

Iowa Railroad Commission Act exempts street railways from jurisdiction. Act of 1907 authorizes interurban railways to use city railway tracks and facilities upon payment of compensation, except for local business. Disagreements to be settled by Railroad Commission or the District Court.

Kansas Railroad Commission. Act of 1907 amending the original act of 1901, excluded street railways from general jurisdiction of Commission when operating exclusively within any county.

Minnesota Railroad Commission does not regulate street railways, but has conducted a complete valuation of railroad property within the State.

South Dakota Railroad Commission Law excepts street railways but provides for general valuation of all carriers.

MISCELLANEOUS ACTS OF OTHER STATES.

Texas. Act of 1907 conferring power of eminent domain on interurban railway companies, permits entry into municipalities by easement over city railway tracks. Routes and terms to be fixed by local authorities.

New Hampshire Act of 1907 provides that all double truck cars shall be equipped with power brakes approved by the Railway Commission.

Ohio Act of 1908 permits any municipality to authorize the construction of elevated railroads and tunnels. Municipal franchises may provide for purchase and ownership by the city, but must limit the rate of fare within the city to five cents. Referendum obligatory upon petition of ten per cent. of the voters.

Missouri Act of 1907 permits cities of 100,000 population to build or acquire subways for transportation of persons, express or freight, which subways may be operated or leased for a period not over fifty years if ratified by referendum. The municipality may issue bonds payable out of subway income.

Act of extra session of 1907 empowers cities to pass ordinances fixing public utility rates, subject to Court review, or to establish Public Utility Commissions for this purpose. St. Louis, St. Joseph and Kansas City, Mo. have taken advantage of this provision.

Section V.—Board of Public Utilities, Los Angeles, California.

Created by City Ordinance on referendum vote. Three Commissioners were appointed by the Mayor December 20, 1909. The principal duties of the Board as prescribed in the ordinance are noted below:

1. *Jurisdiction.* "To *investigate* each year the affairs of all persons firms or corporations operating or maintaining water, electric lighting, power, gas or telephone systems, or *street railways*, of interurban railroads, or other public service utilities in Los Angeles, and compile such *data* as may be necessary to determine the *proper charges* for the services furnished or supplied, as provided in the charter of said City, or otherwise by law. Such data shall include a *valuation* of the physical properties, a detailed statement of gross and net *earnings* and *expenses*, and the capitalization and indebtedness thereof, and such other matters as the Board may deem proper, and shall also include such facts and figures as may be obtainable regarding the operation and maintenance of similar systems and utilities in other municipalities."

2. *Service Charges.* "To *recommend* to the City Councils, prior to the first day of March of each year, a *schedule of charges* for the services specified in subdivision 1 of this section."

3. *Complaints.* "To investigate *complaints* against the service or charges of any person, firm or corporation operating any public service utility in Los Angeles, and to *recommend legislation* or action to executive

officers of the City whenever in the judgment of the Board such legislation or such action may be necessary."

4. *Inspection.* "To superintend the *inspection* of all public utilities and services in Los Angeles as to their compliance with their franchises and with law and the ordinances, their *service* and charges and their *treatment of the public*, and from time to time to recommend such legislation or executive action as may be required."

5. *Franchise Record.* "To prepare and keep a detailed and indexed *record* of all public service *franchises* granted by the City that are now in existence or that may hereafter be granted, showing the date, location, term thereof, and all other essentail facts, and a similar record, so far as practicable, of all other public franchises exercised in Los Angeles." Franchises must be referred to the Board for its recommendations before being advertised for sale.

6. *Annual Report.* "To *report* to the City Council in June of each year the essential facts and figures concerning the aforesaid public utilities operated and maintained in Los Angeles, *comparing* their charges and character of service with those of similar utilities in other municipalities."

From the above, it will appear that the Board has advisory duties. Its scope of authority in dealing with corporations and laws relating thereto is somewhat limited owing to the reservation of authority over certain utilities (*) by State Constitution and by the existence of other specific regulative acts. The charter powers of the City vests in the City Councils—authority to regulate service and rates of certain utilities under which power the City has somewhat enlarged the scope of its operations by supplementary ordinances. The City Charter provides for regulation of speed and traffic of transportation companies and the Civil Code, over construction and operation of street railways, joint occupancy, fares, etc. There is no officer directly charged with inspection of railway service except within the scope of regular police duty. A more consistent and uniform policy in dealing with all utilities is therefore advocated by the Board through supplementary legislation.

Section VI.—Results of Traction Settlement Ordinances.

CHICAGO. As the three year rehabilitation period has practically expired (April 15, 1910, for the Chicago City Railway; January 28, 1911, for the Chicago Railways Company) the results accomplished will be of interest. Prior to this period, the Traction Valuation Commission established values for each of the railways systems, terminating and evaluating all prior traction grants and these findings established a total value for the Chicago City Railway, Chicago Railways, Calumet & South Chicago and Southern Street Railway Companies of $55,775,000, including unexpired franchises values.

During this so-called reconstruction period a total of approximately $60,000,000 ($59,417,605.38 on December 1, 1910, not including final certificates for November, 1910) had been expended, exclusive of $657,705 expended out of earnings.

On this rehabilitation work the companies were allowed by the February 11th ordinances to cover brokerage and construction profits, 15% on the cost (exclusive of minor adjustments of accounts) as approved by the Board of Supervising Engineers, which percentages amounted to $7,155,232.13 on December 1, 1910 (subject to the increase allowed under the final certificate for November, 1910). The magnitude of this work is brought out more forcibly by the fact that it comprises about 400 miles of track and that on the entire reconstruction work there has been at times as many as 10,000 men employed. The new and reconstructed sub-stations have a capacity of nearly 100,000 kilowatts; more than 2,000 new double truck pay-as-you-enter cars have been installed in service; 415 miles of trolley, 1150 miles of copper cable have been installed, and a score or more of new buildings erected. Never in Chicago's history have the right-of-way and adjacent roadway been so well paved as under the present ordinances.

*Railroad and telegraph companies are under jurisdiction of State Board of Railroad Commissioners.

The City's share in the form of cash return—55% of residual net income —will aggregate more than $5,000,000 on January 31, 1911 ($4,227,747 to January 31, 1910). The annual amount has been decreasing year by year during the above referred to reconstruction period owing to the rapid increase in Capital Account upon which the five per cent. annual return is allowed under the ordinances, but it is expected that not only the City's but also the Company's net profit will gradually increase after the rehabilitation period, when all replacements are made from the renewal funds.

The total expenses of the Board of Supervising Engineers has averaged a little less than 1.6% of the rehabilitation expenditures.

The extension of the prescribed plan of through routes has been accomplished by the gradual elimination of physical difficulties which were encountered on every route preventing the operation of standard double truck cars. Improvement in equipment has been accomplished with theassistance of technical investigations on such subjects as track deflections, strength and durability of materials, power consumption and distribution, forced ventilation of cars, chemical preservation of ties, etc., and as a result, standards have been discussed and adopted for track and rolling stock. All steel, non-combustible cars have been introduced, and the pay-as-you-enter feature installed on all of the new and much of the old equipment.

Comparative studies were made during 1907-8 before and after the introduction of the pay-as-you-enter cars. When normal increase in traffic was allowed for, the results indicated a closer collection of fares, a reduction in car hours (which, for the same service, means greater rapidity in handling passengers) increase in receipts per car hour and a corresponding decrease in accidents.

CLEVELAND. The first trial period for the operation of the Cleveland Railway Company on the basis of the Tayler franchise plan ended November 30th. Exact returns are unavailable as yet, but the following notes (*) are of interest. For the entire trial period, the interest fund showed a surplus of approximately $50,000 in excess of the permanent amount stipulated in the ordinance—$500,000. The maintenance and reserve fund also showed a surplus, but the operating fund, a deficit since the advance in wages. For the first six months, reports show (†) as follows: "The expenditures for the maintenance of the Company's property exceeded the amount allowed by the ordinance by $231,494 * * * or 34.5%. Much of this expenditure was for repair and renewal of track. The 11.5 cents per car mile allowed by the ordinance for operating expenses other than maintenance, amounted during this same six months to $1,529,117. The actual expenditures were $1,506,823, leaving a surplus of $22,294."

It is reported (‡) that the system has been operated on the most limited margin since the settlement was reached. No extensions are being made and no improvements are being contemplated. and none can be made unless the demand for the Company's stock improves, so that the coming winter will probably bring a crisis in the three cent fare situation.

On December 5th a resolution was passed by Councils instructing the Street Railway Commissioner to investigate the situation with a view to securing better service. Extreme dissatisfaction with the service exists not only with the public but with the Company as the equipment is inadequate to meet the growth of the City. This situation the company frankly admits, but declares itself powerless to remedy under the prevailing franchise conditions. The refunding contemplated by the ordinance cannot be carried out as the stock still holds some points below par. The rehabilitation and extensions of the system that are necessary are due to the run down condition of the property when the ordinance went into force. In brief, the Company has exhausted its credit, largely due to the limitations on company return and income imposed by the low rate of fare. In 1912 and 1913, over eight million dollars in bonded debt matures. Refunding was contemplated by the sale of stock, but the ordinance prohibits sales below par in the belief, that the "security of investment" produced by the ordinance would attract

* Electric Railway Journal, Dec. 10, 1910.
† Electric Railway Association, October 1910.
‡ Electric Railway Journal, Nov. 19, 1910.

sufficient capital. The stock, however, continues below par. To meet public dissatisfaction and attempt some provision for the future, a movement is on foot to force either a raising of the maximum fare to five cents or else a modification of the Tayler plan for granting of additional franchise security whereby refunding could be carried out on a four or four and five-tenths per cent. instead of six per cent. basis, as provided for in the ordinance on refunding bonds.

PHILADELPHIA. Serious dissatisfaction with the settlement ordinance of 1907 seems to have arisen in Philadelphia, as indicated by the following ordinance recently passed by Councils.

> "Whereas the chief argument for the adoption of the ordinance creating the agreement of contract between the City and the Philadelphia Rapid Transit Company was the solemn promise of an improved service; and
>
> "Whereas, the facilities as a whole, are today even more deplorably inadequate than they were before the contract of 1907 was entered into, routes and fares, particularly in South Philadelphia as well as in other sections of the city, being changed, radical alterations being made since October 1st, to the decided disadvantage of the public;
>
> "Resolved, by the Select and Common Councils of the City of Philadelphia that the Philadelphia Rapid Transit Company be requested to restore the service at least as it existed before October 1st, and
>
> "Resolved that the company be requested to communicate to Councils its plans for the financial and physical development of the system."

The Philadelphia traction system has operated for the past four years with a deficit. During the fiscal year 1910, this deficit reached the maximum, $1,329,722, or 7.18% of the gross income. This deficit was materially augmented by the prolonged strike, the extraordinary expenses of which were written off in the year's account. Considerable increase in fixed charges wages and taxes also took place during this year. The Phildelphia Rapid Transit Company guarantees an annual rental under its present lease of the Union Traction Company lines, of six per cent. on $30,000,000 capital stock, or $1,800,000, equivalent to 9.7% of the present gross income.

That efforts have been made by the operating company to relieve the present unsatisfactory situation is evidenced by its endeavor to secure the support of certain financial interests through representation upon its directorate. The conditions of acceptance imposed by these interests are quoted below:

> " * * * in view of the Transit company's financial requirements, I feel that I can only accept this responsibility upon a certain definite understanding by which the Union Traction Company will guarantee the Transit Company's obligations to provide such new capital as may be required until such time as the net earnings of the system are sufficiently increased as to make possible the sale of the Philadelphia Rapid Transit Company's securities on their own merits, * * * and that a sufficient amount be appropriated from the earnings to properly maintain the property."

Recent developments indicate the substantial execution of these plans subject to ratification of stockholders, and the following points (*) have been brought out:

1. "A property of this size should have $1,500,000 to $2,000,000 per year available to meet new capital requirements, and this expenditure is recommended for a period of five years to enable the Philadelphia system to then be in a position to raise additional future capital upon its own credit."

2. "There should go back into the property for maintenance and renewals an amount equal to fifteen per cent. of its gross receipts, which is about three per cent. more than is now being appropriated by the company for this purpose."

* Electric Railway Journal, Dec. 17, 1910.

An important phase of rapid transit developments in Philadelphia for the immediate future is the legislation now under contemplation through which the city will be empowered by Constitutional amendment to increase its borrowing power by the exemption of revenue producing bonds from the present debt limit.

LOS ANGELES. The Board has jurisdiction over thirty-one public utilities, aggregating about $65,000,000 in physical property, four of these being electric railways.

The first years operations have largely been devoted to studies and conferences, and the Board reports that the Companies are more inclined than formerly to meet legitimate demands when all the facts are before them.

Overcrowding is attributed largely to conditions peculiar to Los Angeles and to the rapid growth of the City.

The extension of the transfer privilege is under negotiation. Neither the California Statutes nor the City Charters include specific provisions on the transfer question.

A traffic conference has been provided for to include members of the Board and officials of the railway Companies, and traffic studies have been made upon which to base future negotiations.

Standardizing of corporate accounting and physical valuation has been facilitated by the preparation of forms for this purpose, the latter indicating extent, reproduction value, accrued depreciation and present value of property

Uniform five cent fare within the expanded city limits is under consideration, especially on account of the numerous interurban lines entering the city

The handling of light freight traffic over the railway lines is a problem before the Board. While the necessity is conceded, it seems desirable to establish channels of development distinct from passenger traffic. In this question is involved the elimination of grade crossings.

On the whole the expressed attitude of the Board may be characterized as concessionary rather than arbitrary as securing better results by this than by any other method of procedure.

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